North Carolina Transmission Planning Collaborative

Report on the NCTPC 2008-2018 Collaborative Transmission Plan

12-22-08

Table of Contents

I. Executive Summary

The North Carolina Transmission Planning Collaborative ("NCTPC") was established to:

1) provide the Participants (Duke Energy Carolinas, Progress Energy Carolinas, Inc., North Carolina Electric Membership Corporation, and ElectriCities of North Carolina) and other stakeholders an opportunity to participate in the electric transmission planning process for the Participants in the State of North Carolina;

2) preserve the integrity of the current reliability and least-cost planning processes;

3) expand the transmission planning process to include analysis of increasing transmission access to supply resources inside and outside the control areas of Duke Energy Carolinas ("Duke") and Progress Energy Carolinas, Inc. ("Progress"); and

4) develop a single coordinated transmission plan for the Participants in North Carolina that includes reliability and enhanced transmission access considerations while appropriately balancing costs, benefits and risks associated with the use of transmission and generation resources.

The 2007-2017 Collaborative Transmission Plan (the "2007 Collaborative Transmission Plan" or the "2007 Plan") was published in January 2008. In addition to reliability study results and potential solutions, that report included study results and potential solutions for a variety of hypothetical import scenarios and new generation into/in the Duke Energy and Progress Energy control areas. In May 2008, the NCTPC published the Supplemental Report on the NCTPC 2007-2017 Collaborative Transmission Plan (the "2007 Supplemental Report"). The purpose of the 2007 Supplemental Report was to report on transmission alternatives studied by the PWG to accommodate potential changes in designated resources to supply load in the Progress western control area using imports from and across the Duke system, and also provide detail on two major upgrade projects in the Progress Energy area added to collaborative plan shortly after the 2007 Plan was published.

This report documents the current 2008 – 2018 Collaborative Transmission Plan ("2008 Plan") for the Participants in North Carolina. The initial sections of this report provide an overview of the NCTPC Process as well as the specifics of the 2008 reliability planning study scope and methodology. The NCTPC Process document and 2008 NCTPC study scope document are posted in their entirety on the NCTPC website at

http://www.nctpc.org/nctpc/listDocument.do?catId=REF.

While the overall NCTPC Process (Figure 1 in Section II) includes both a Reliability Planning Process and an Enhanced Transmission Access Planning Process, the 2008 NCTPC Process (Figure 2 in Section III) focused exclusively on the Reliability Planning Process resulting because stakeholders did not request any Enhanced Transmission Access scenarios for the 2008 Study. Enhanced Transmission Access scenarios will again be solicited for the 2009 Study and included if appropriate.

The scope of the Reliability Planning Study included a base reliability analysis as well as sensitivity analyses of hypothetical wind generation injected into the transmission system in eastern and western North Carolina and an examination of proposed changes to the NERC TPL standards. The purpose of the base reliability analysis was to evaluate the transmission system's ability to meet load growth projected for 2013 through 2018 with the Participants' assumed Designated Network Resources ("DNRs"). The purpose of the sensitivity analyses was to provide an indication of the potential impact on transmission from new hypothetical wind generation resources and to investigate potential system impacts related to proposed changes to the NERC TPL ("Transmission Planning") Reliability Standards.

The latter sections of the report and the corresponding appendices detail the base reliability analysis and sensitivity results and the specifics of the 2008 Plan resulting from the base reliability analysis. The NCTPC reliability study results verified that Duke and Progress continue to have projects planned to address reliability concerns for the near-term (5 year) and the long-term (10 year) planning horizons that were previously identified in the 2007 Plan.

The 2008 Plan is detailed in Appendix B which identifies the projects planned with an estimated cost of greater than $10 million. Projects in the 2008 Plan are those projects identified in the base reliability study. For each of these projects, Appendix B provides the project status, the estimated cost, the planned in-service date, and the estimated time to complete the project. Appendix D provides a comparison of this years Plan to the 2007 Supplemental Plan.

Relative to the 2007 Supplemental Plan, the new or modified projects for Progress in the 2008 Plan include:

- Delayed the Greenville-Kinston Dupont 230 kV line project from 2011 to 2013;
- Reconductor the Durham-RTP 230 kV line;
- Folkstone 230/115 kV Substation.

The new or modified projects for Duke in the 2008 Plan include:

- Reconductor the Elon 100 kV (Sadler Tie-Glen Raven Main) Line.

The wind sensitivity study modeled 250 MW of hypothetical wind generation in the eastern region of the Progress Energy service area, 300 MW in the Progress western region, and 200 MW in the Duke service area. The study results did not produce any new thermal or voltage violations, and did not impact any projects in the NCTPC plan. Exhibits I and II show the approximate geographic locations of the hypothetical wind generation studied.

Exhibit I
Progress Western Region

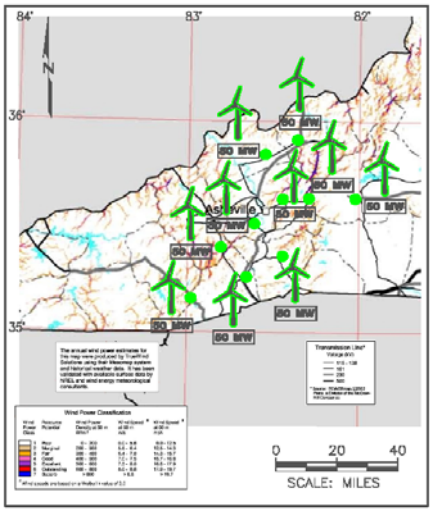
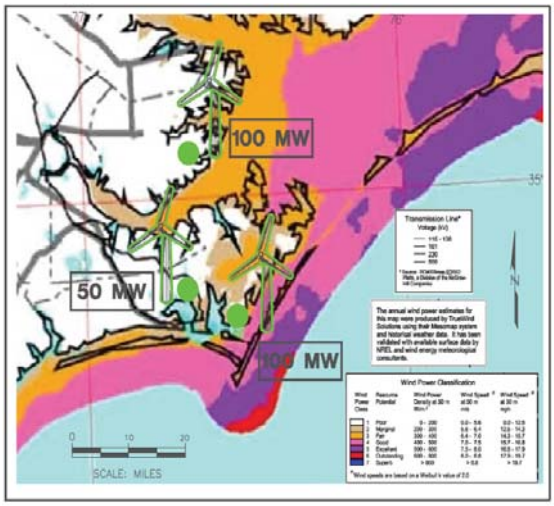


Exhibit II
Progress Eastern Region



The TPL Standard sensitivity analysis evaluated the impact of a subset of proposed revisions to the existing TPL-001 through 004 standards.

For Duke, the results did not indicate any impact on 230 kV and above (EHV) planned projects or require new projects during the 10 year planning horizon. For the EHV, some contingencies would require operating guides to adjust generation between contingencies. There were 38 projects identified on Duke 100 kV facilities that would be accelerated to enable the Duke transmission system to operate reliably under the impact of the contingencies studied. The net present value of the acceleration is on the order of $80 to $100 million dollars.

For Progress, the EHV results indicated only one significant impact, for which a solution is currently being developed. Some contingencies would require operating guides, adjustments to generation between contingencies, and possibly minor line equipment upgrades. There were 32 projects on Progress' 115kV network that would be accelerated to enable the Progress transmission system to operate reliably under the impact of the contingencies studied. The net present value of the accelerations is approximately $200 million dollars.

In this year of the NCTPC Process, the Participants validated and continued to build on the information learned from last year's efforts. Each year the Participants will look for ways to improve and enhance the planning process. The study process confirmed again this year that the joint planning approach produces benefits for all Participants that would not have been realized without a collaborative effort.

II. North Carolina Transmission Planning Collaborative Process

II.A. Overview of the Process

The NCTPC Process was established by the Participants to:

1) provide the Participants and other stakeholders an opportunity to participate in the electric transmission planning process for the Participants in the State of North Carolina;

2) preserve the integrity of the current reliability and least-cost planning processes;

3) expand the transmission planning process to include analysis of increasing transmission access to supply resources inside and outside the control areas of Duke and Progress; and

4) develop a single coordinated transmission plan for the Participants in North Carolina that includes reliability and enhanced transmission access considerations while appropriately balancing costs, benefits and risks associated with the use of transmission and generation resources.

The overall NCTPC Process includes the Reliability Planning and Enhanced Transmission Access Planning ("ETAP") processes, whose studies are intended to be concurrent and iterative in nature. The NCTPC Process is designed such that there will be considerable feedback and iteration between the two processes as each effort's solution alternatives affect the other's solutions.

The Oversight Steering Committee ("OSC") manages the NCTPC Process. The Planning Working Group ("PWG") supports the development of the NCTPC Process and coordinates the study development. The Transmission Advisory Group ("TAG") provides advice and makes recommendations regarding the development of the NCTPC Process and the study results.

The purpose of the NCTPC Process is more fully described in the Participation Agreement which is posted at http://www.nctpc.org/nctpc/listDocument.do?catId=REF. Figure 1 illustrates the major steps associated with the NCTPC Process.

II.B. Reliability Planning Process

The Reliability Planning Process is the transmission planning process that has traditionally been used by the transmission owners to provide safe and reliable transmission service at the lowest reasonable cost. Through the NCPTC, this transmission planning process was expanded to include the active participation of the Participants and input from other stakeholders through the TAG.

The Reliability Planning Process is designed to follow the steps outlined in Figure 1. The OSC approves the scope of the reliability study, oversees the study analysis being performed by the PWG, evaluates the study results, and approves the final reliability study results. The Reliability Planning Process begins with the incumbent transmission owners' most recent reliability planning studies and planned transmission upgrade projects.

In addition, the PWG solicits input from the Participants for different scenarios on where to include alternative supply resources to meet their load demand forecasts in the study. This step provides the opportunity for the Participants to propose the evaluation of other resource supply options to meet future load demand due to load growth, generation retirements, or purchase power agreement expirations. The PWG analyzes the proposed interchange transactions and/or the location of generators to determine if those transactions or generators create any reliability criteria violations. Based on this analysis, the PWG provides feedback to the Participants on the viability of the proposed interchange transactions or generator locations for meeting future load requirements. The PWG coordinates the development of the reliability studies and the resource supply option studies based upon the OSC-approved scope and prepares a report with the recommended transmission reliability solutions.

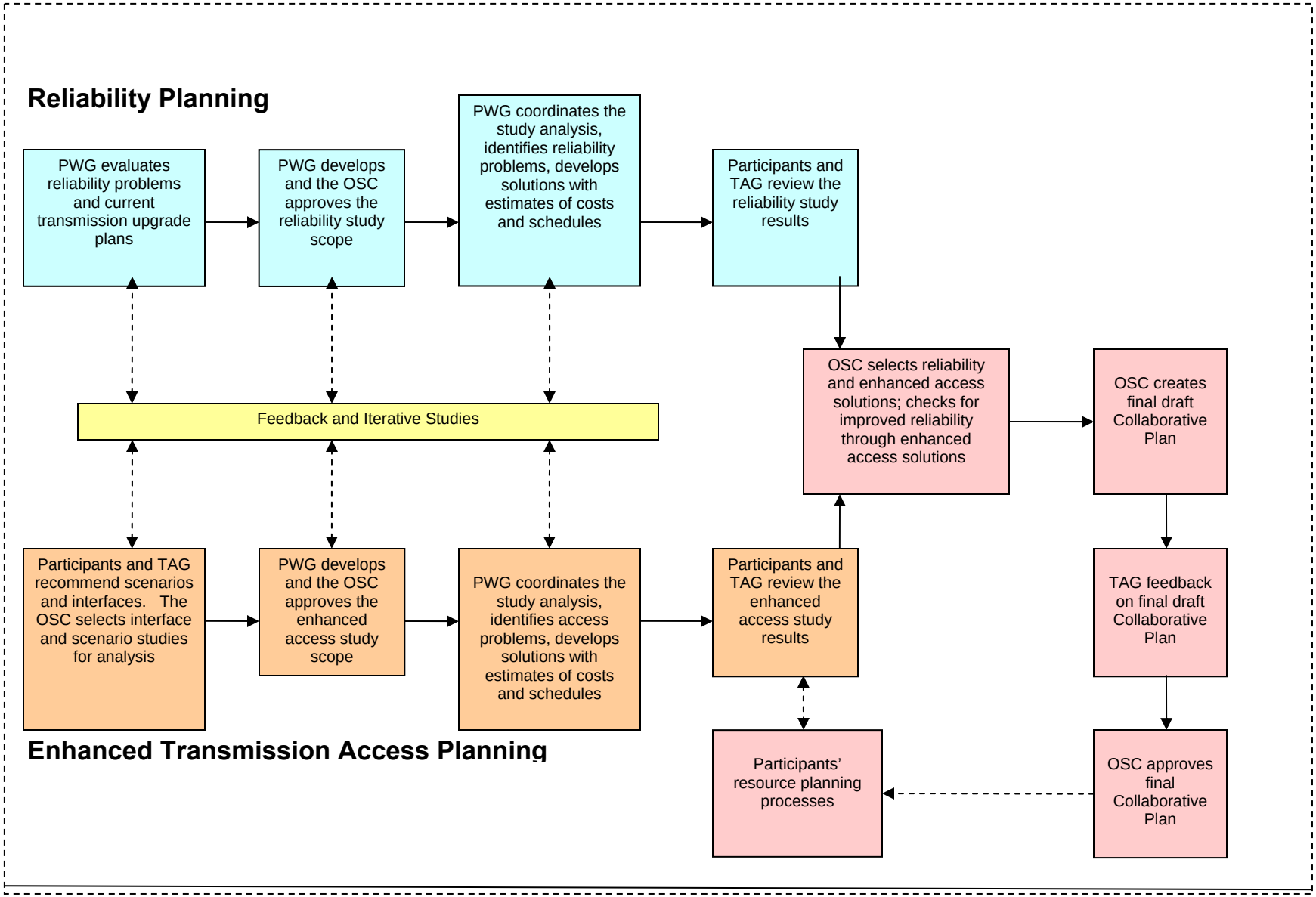
The final results of the Reliability Planning Process includes summaries of the estimated costs and schedules to provide any transmission upgrades and/or additions: (i) needed to maintain a sufficient level of reliability necessary to serve the native load of all Participants; and (ii) needed to reliably support the resource supply options studied. The reliability study results are reviewed with the TAG.

II.C. Enhanced Transmission Access Planning Process

The ETAP Process evaluates the means to increase transmission access for Load Serving Entities ("LSEs") in North Carolina to potential network resources inside and outside the control areas of Duke and Progress. The ETAP Process follows the steps outlined in Figure 1. The OSC approves the scope of the ETAP study (including any changes in the

assumptions and study from those used in the reliability analysis), oversees the study analysis being coordinated by the PWG, evaluates the study results, and approves the final ETAP study results.

Figure 1
2008 NCTPC Process Flow Chart



The ETAP Process begins with the Participants and TAG members proposing scenarios and interfaces to be studied. The proposed scenarios and interfaces are compiled by the PWG and then evaluated by the OSC to determine which ones will be included for analysis in the current planning cycle. The PWG coordinates the development of the enhanced transmission access studies based upon the OSC-approved scope and prepares a report which identifies recommended transmission solutions that could increase transmission access.

The final results of the ETAP Process include the estimated costs and schedules to provide the increased transmission capabilities. The enhanced transmission access study results are reviewed with the TAG.

II.D. Collaborative Transmission Plan

Once the reliability and ETAP studies are completed, the OSC evaluates the results and the PWG recommendations to determine if any proposed enhanced transmission access projects and/or resource supply option projects will be incorporated into the final plan. If so, the initial plan developed based on the results of the reliability studies is modified accordingly. This process results in a single Collaborative Transmission Plan being developed that appropriately balances the costs, benefits and risks associated with the use of transmission and generation resources. The final plan is reviewed with the TAG.

The Collaborative Transmission Plan information is available for Participants to identify any alternative least cost resources to include with their respective Integrated Resource Plans. Other stakeholders can similarly use this information for their resource planning purposes.

III.2008 Reliability Planning Study Scope & Methodology

The 2008 Reliability Planning Process included a base reliability study and selected sensitivity case analyses. The base reliability study assessed the reliability of the transmission systems of both Duke and Progress in order to ensure reliability of service in accordance with North American Electric Reliability Corporation ("NERC"), SERC Reliability Corporation ("SERC"), and Duke and Progress requirements. The purpose of the base reliability study was to evaluate the transmission systems' ability to meet load growth projected for 2013 through 2018 with the Participants' assumed DNRs. The 2008 Study allowed for identification of any new system impacts not currently addressed by existing transmission plans in which case solutions were developed. The 2008 Study also allowed for adjustments to existing plans where necessary.

In the previous two years, the NCTPC Process included resource supply option analysis to evaluate transmission impacts of hypothetical alternative resource supply options, such as power imports or alternative generating facilities, to meet future load requirements. As the 2008 study scope was being prepared, Participants considered the value of reviewing those resource supply option impacts for a third consecutive year. Participants determined that resource supply option analysis similar to what had been conducted in the past would likely yield little new information this year. This decision was based upon the fact that the study would be incremented just one year into the future for both the near-term and long-term analysis and that no major changes were projected for base assumptions, such as load and resources, in that time frame. Rather, Participants determined that more value might be gained from the 2008 study by exploring some scenarios other than resource supply options, with the agreement that resource supply options may be evaluated again in future studies.

Participants selected sensitivity scenarios for the 2008 study around two issues currently receiving substantial attention relative to power system planning. First, recent attention has been drawn to renewable energy in North Carolina with the approval of the state's Renewable Energy Portfolio Standard in 2007. As a result the OSC recommended that a wind energy scenario be included in the 2008 NCTPC study. To accommodate this request, the PWG developed a wind sensitivity case for 2018 where hypothetical wind resources were located in the western mountains and along the eastern coast of North Carolina. Table 1 describes the size and location of wind resources included in the scenario.

Table 1
Wind Sensitivity

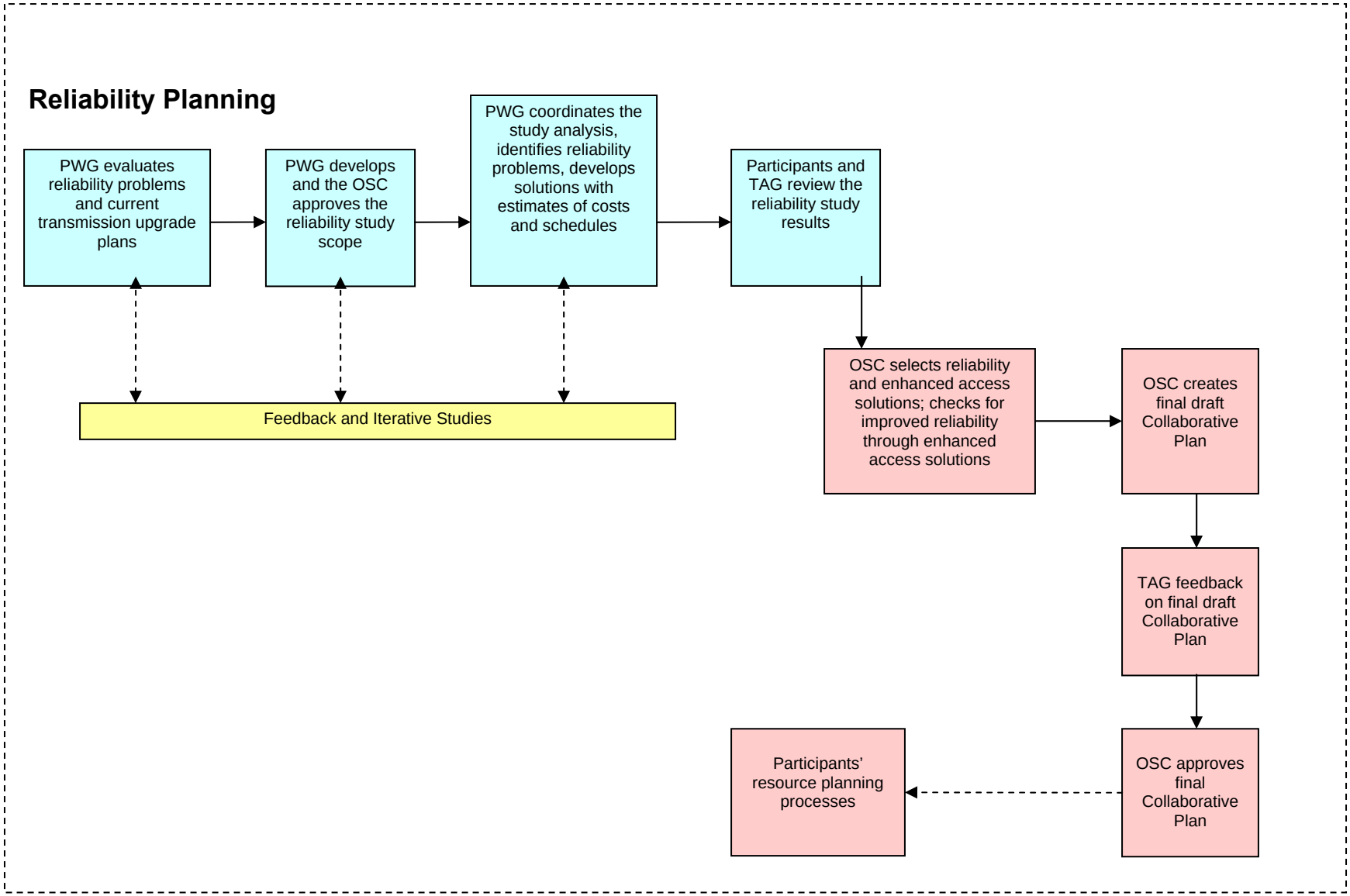
Control Area	MW of hypothetical wind generation injected on-peak
Duke Control Area	200 MW
Progress Energy Western Control Area	300 MW
Progress Energy Eastern Control Area	250 MW

A second development in the industry that would directly impact transmission planning involves NERC TPL Reliability Standards. The scope of the analysis went beyond the impact of the existing standards and reviewed the impact from the new proposed revisions. The NCTPC's transmission planning activities are presently conducted in accordance with existing NERC Reliability Standards for transmission planning. These standards establish transmission planning performance requirements within the planning horizon intended to ensure the development of a reliable and robust bulk electric system. Currently, a NERC Standards Drafting Team of industry experts is revising those standards. Anticipated changes to the standards could require transmission planners to plan to more stringent reliability requirements. Although the standards revisions are still under development, there is some confidence that particular requirements may be adopted, so the NCTPC decided to perform a sensitivity on the base case to examine the potential impact of these revised requirements on the Collaborative Transmission Plan. For this analysis, the PWG jointly evaluated the impact of various multiple contingencies on the Duke and Progress Energy systems. The multiple EHV contingencies considered in the TPL Standards Sensitivity Case were:

- Sequential loss of two EHV lines or transformers;
- Common tower and common breaker failures.

The 2008 NCTPC Process did not include enhanced transmission access studies. In February, 2008, the OSC solicited input from the TAG on scenarios and interfaces to be studied as part of the development of the 2008 Collaborative Transmission Plan. The OSC did not receive any requests for ETAP studies from the TAG. As a result, the OSC decided that for the development of the 2008 Collaborative Transmission Plan, the NCTPC would focus all its resources on the Reliability Planning Process. The ETAP Process will be included as part of the development of the 2009 Collaborative Transmission Plan and input will be solicited from the TAG as part of the 2009 NCTPC Process. Figure 2 illustrates the revised steps for the 2008 NCTPC Process.

Figure 2
2008 NCTPC Process Flow Chart - Revised



III.A. Assumptions

1. Study Year and Planning Horizon

The 2008 Collaborative Transmission Plan addresses a 10 year planning horizon through 2018. The study years chosen and cases developed for the 2008 Study are listed in Table 2.

Table 2
Study Years

Study Year / Season	Analysis
2013 Summer	Near-term base reliability
2013 Summer	Fayetteville PWC Sensitivity
2018 Summer	Long-term base reliability
2018 Summer	Wind Sensitivity
2018 Summer	NERC TPL Standards Sensitivity

Line loading results for 2013 and 2018 were extrapolated into the future assuming the line loading growth rates in Table 3. This allowed assessment of transmission needs throughout the planning horizon. The line loading growth rates are based on each company's individual load growth projection.

Table 3
Line Loading Growth Rates

Company	Line Loading Growth Rate
Duke	1.6 % per year
Progress	2.0 % per year

2. Network Modeling

The network models developed for the 2008 Study included new transmission facilities and upgrades for the 2013 and 2018 summer periods, as appropriate, from the current transmission plans of Duke and Progress and from the 2007 Collaborative Transmission Plan as modified by the 2007 Supplemental Report. Table 4 lists the planned major transmission facility projects with an estimated cost of $10 million or more each. Table 5 lists the generation facility additions and retirements included in the 2013 and 2018 models. These generation additions were needed to fulfill the modeled load obligations of Duke and Progress in the development of the base cases and/or Duke's generator maintenance cases.

Table 4
Major Transmission Facility Projects Included in Models

Company	Transmission Facility	2013 Base & Sensitivity	2018 Base & Sensitivities
Progress	Upgraded Lee Sub-Wommack 230 kV South Line	Yes	Yes
Progress	Durham 500 kV Sub	Yes	Yes
Progress	Durham-Falls 230 kV Line	Yes	Yes
Progress	Upgraded Rockingham-West End 230 kV Line	Yes	Yes
Progress	Clinton-Lee 230 kV Line	Yes	Yes
Progress	Installed Series Reactor at Richmond 500 kV Sub	Yes	Yes
Progress	Converted Asheville-Enka 115 kV Line to 230 kV	Yes	Yes
Progress	Asheville-Enka 115 kV Line	Yes	Yes
Progress	Richmond-Fort Bragg Woodruff Street 230 kV Line	Yes	Yes
Progress	Jacksonville 230 kV SVC	Yes	Yes
Progress	Greenville-Kinston Dupont 230 kV Line	Yes	Yes
Progress	Rockingham-West End 230 kV East Line	Yes	Yes
Progress	Harris Plant-RTP 230 kV Line	Yes	Yes
Progress/ Duke	Asheboro-Pleasant Garden 230 kV Line	Yes	Yes
Progress	Rockingham-Lilesville 230 kV Line	Yes	Yes
Progress	Added 3rd 500/230 kV Wake Bank	Yes	Yes

Company	Transmission Facility	2013 Base & Sensitivity	2018 Base & Sensitivities
Progress	Folkstone 230/115 kV	No	Yes
Progress	Durham-RTP 230 kV Line	No	Yes
Progress	Installed Series Reactor at Cape Fear-West End 230 kV West Line	No	Yes

Table 5
Major Generation Facility Additions and Retirements in Models[1]

Company	Generation Facility	2013	2018
Duke	Retired Cliffside Units 1-4 (202 MW)	Yes	Yes
Duke	Retired Buck 3 & 4 (113 MW)	Yes	Yes
Duke	Retired Dan River 1-3 (276 MW)	Yes	Yes
Duke	Retired Dan River CT's (85 MW)	No	Yes
Duke	Retired Riverbend CT's (120 MW)	No	Yes
Duke	Retired Buck CT's (93 MW)	No	Yes
Duke	Retired Buzzard Roost CT's (196 MW)	No	Yes
Duke	Added Cliffside Unit 6 (880 MW)	Yes	Yes
Duke	Added Dan River CC (620 MW)	Yes	Yes
Duke	Added Buck CC (620 MW)	Yes	Yes
Duke	Added Lee CC (620 MW)	Yes	Yes
Duke	Added Anderson CC (620 MW)	No	Yes
Duke	Added Newport CC (620 MW)	No	Yes
Duke	Added Rockingham CT (628 MW)	Yes	Yes
Progress	Added Wayne County (300 MW)	Yes	Yes
Progress	Added Richmond Co. CC (650 MW)	Yes	Yes

3. Interchange and Generation Dispatch

Each Participant provided a resource dispatch order for each of its DNRs for the Duke and Progress control areas. Generation was dispatched for each Participant to meet that Participant's peak load in accordance with the designated dispatch order.

[1] A Certificate of Public Convenience and Necessity has been granted for Cliffside Unit 6, Dan River CC and Buck CC. All other generation additions listed in Table 5 are placeholders for modeling purposes.

Interchange in the summer base cases were set according to the DNRs identified outside the Duke and Progress control areas. Interchange tables for the summer base cases and the summer Progress Transmission Reliability Margin ("TRM") cases[2], are in Appendix A.

III.B. Study Criteria

The results of the base reliability study were evaluated using established planning criteria, while recognizing differences between the systems of Duke and Progress. The planning criteria used to evaluate the results include:

1) NERC Reliability Standards;
2) SERC requirements; and
3) Individual company criteria.

The TPL sensitivity study was based on the spring 2008 draft of proposed NERC Reliability Standard TPL-001-1. Some of the proposed criteria in this draft of the standard were applied to the 2018 base case to compare the difference in results between using the proposed criteria and using the criteria in the existing standards.

III.C. Case Development

The base case for the base reliability study was developed using the most current 2007 SERC Long Term Study Group (LTSG) model for the systems external to Duke and Progress. The LTSG model of the external systems, in accordance with ERAG Multiregional Modeling Working Group (MMWG) criteria, included modeling known long-term firm transmission reservations. Detailed internal models of the Duke and Progress East/West systems were merged into the base case, including Duke and Progress transmission additions planned to be in service by the period under study. An additional sensitivity case was studied for 2013S that modeled an additional 500 MW transfer from Duke to Fayetteville PWC.

III.D. Technical Analysis and Study Results

Contingency screenings on the base case were performed using Power System Simulator for Engineering ("PSS/E") power flow. Each transmission owner simulated its own transmission and generation contingencies on its own transmission system.

[2] Since Progress is an importing system, the worst case for studying imports into Progress is to start with a case that models all firm import commitments, including designated network resources and TRM. Progress calls this maximum import case its TRM case.

Duke created generator maintenance cases that assume a major unit is removed from service and the system is economically re-dispatched to make up for the loss of generation.

The generator maintenance cases developed were:

Allen 4	Allen 5	Bad Creek 1
Belews Creek 1	Buck 5	Catawba 1
Cliffside 5	Cliffside 6	Dan River 3
Jocassee 1	Lee 3	Marshall 3
McGuire 1	McGuire 2	Oconee 1
Oconee 3	Riverbend 6	Riverbend 7
Buck CC	Dan River CC	Rowan CC
Rockingham 1	Thorpe	Nantahala

Progress created generation down cases which included the use of TRM. Progress TRM cases model interchange to avoid netting against imports, thereby creating a worst case import scenario. To model this worst case import scenario for TRM, cases were developed from the 2013 and 2018 base cases with either a Brunswick 1 unit outage or a Harris 1 unit outage with the remainder of TRM addressed by miscellaneous unit de-rates.

To understand regional impacts on each other's systems, Duke and Progress have exchanged their transmission contingency and monitored elements files in order for each company to simulate the impact of the other company's contingencies on its own transmission system. Contingencies outside Duke and Progress that could impact the areas were also evaluated. In addition, each company coordinated generation adjustments to accurately reflect the impact of each company's generation patterns.

The technical analysis was performed in accordance with the study methodology. The results from the technical analysis for the Duke and Progress systems were shared with all Participants. Solutions of known issues within Duke and Progress were discussed. Any issues identified in the 2008 Study were also discussed with all Participants so that all are aware of potential concerns. Appropriate solutions were jointly developed and tested.

The results of the technical analysis were reported throughout the study area based on thermal loadings greater than 90% for base reliability and the sensitivities.

III.E. Assessment and Problem Identification

The PWG performed an assessment in accordance with the methodology and criteria discussed above, with the analysis work shared by Duke and Progress. The reliability issues identified from the assessments of the base reliability cases were documented and shared within the PWG.

III.F. Solution Development

The 2008 Study performed by the PWG confirmed base reliability projects already identified (i) by Duke and Progress in company specific planning studies performed individually by the transmission owners and (ii) by the 2007 Study. The 2013 & 2018 base cases and Fayetteville transfer sensitivity did not identify any new projects for either Duke or Progress.

III.G. Selection of Preferred Reliability Solutions

To meet base reliability requirements, the preferred set of transmission improvements identified in previous studies continue to provide reliable and cost effective transmission solutions to meet customers' needs while prudently managing the associated risks.

III.H. Contrast NCTPC Report to Other Regional Transfer Assessments

For both the Duke and Progress control areas, the results of the PWG study are consistent with the SERC Reliability Review Subcommittee (RRS) assessments for 2008-2017. The limiting facilities identified in the PWG study have been previously identified in the study reports and assessments for similar scenarios. These limiting facilities have also been identified in the individual transmission owner's internal assessments required by NERC reliability standards.

In accordance with the overall spirit of the transmission planning portions of FERC's Order 890, the PWG has also engaged with other regional study groups. Two requests to study 600 MW transfers from the SCE&G to Duke and Santee Cooper to CPLE control areas in the South Carolina Regional Transmission Planning Process (SCRTP) will allow stakeholders to receive a full assessment of the transfer levels studied by the PWG in the 2007 study process. In addition, three additional requests were made on behalf of the PWG to the Southeast Inter Regional Participation Process (SIRPP) to study 3,000 MW transfers between the Southern control area and PJM (both directions) and MISO to VACAR. The Southern to/from PJM study requests were selected by the SIRPP for study and may generate some new ideas for regional bulk transmission upgrades when the study results are available in early 2009.

IV. Base Reliability Study Results

The 2008 Study verified that Duke and Progress have projects planned to address reliability concerns for the near-term (5 year) and long-term (10 year) planning horizons. The 2008 Study results from the reliability studies performed on the 2013 & 2018 base cases were consistent with the 2007 Study results from the reliability studies performed on the 2012 base cases.

The Collaborative Transmission Plan is detailed in Appendix B which identifies the projects planned with an estimated cost of greater than $10 million. Projects in the 2008 Plan are those projects identified in the base reliability study. For each of these projects, Appendix B provides the project status, the estimated cost, the planned in-service date, and the estimated time to complete the project.

The new or modified projects for Progress in the 2008 Collaborative Transmission Plan include:

- Delayed the Greenville-Kinston Dupont 230 kV line project from 2011 to 2013;
- Reconductor the Durham-RTP 230 kV line;
- Folkstone 230/115 kV Substation.

The new or modified projects for Duke in the 2008 Plan include:

- Reconductor the Elon 100 kV (Sadler Tie-Glen Raven Main) lines.

IV.A. Greenville-Kinston Dupont 230 kV Line

This existing project was identified in the base reliability studies performed for the 2007 Collaborative Transmission Plan but has been delayed from 2011 and 2013 based on PEC internal load flow results indicating that the project can be delayed.

IV.B. Durham-RTP 230 kV Line

This existing line reconductoring project was identified in the base reliability studies performed for the 2007 Collaborative Transmission Plan but was not described in the 2007 Plan because the estimated cost at that time was less than $10 million. The current project estimate is now above the $10 million threshold and as such has been included in the 2008 Plan.

IV.C. Folkstone 230/115 kV Substation

As a result of a 2007 PEC internal screen showing low voltage on the Castle Hayne-Jacksonville City 115 kV line a project was initiated to mitigate the voltage problem. The solution was to create a new 230/115 kV substation along the Castle Hayne-Jacksonville 230 kV line and connect this substation to the Castle Hayne-Jacksonville City 115 kV via (2) 115 kV lines. Since the cost of this project is greater than $10 million it has been included in the 2008 plan.

IV.D. Elon 100 kV Line

Flow on the 100 kV lines to the south of the Dan River Steam Station is impacted by the amount of generation dispatched at Dan River and Rockingham. Loss of one circuit of the double circuit line causes increased loading on the remaining line. The construction of a 620 MW combined cycle unit at Dan River drives the need to reconductor the approximately 22 mile 100 kV line from Sadler Tie to Glen Raven Main to bundled 954 ACSR conductor. The $26 M project is needed coincident with the startup of the new generation in 2011.

IV.E. Deferred Projects

On the Duke system, the Antioch 500/230 kV transformer replacement was deferred from the 2013 timeframe indicated by the 2007 Collaborative Transmission Plan and the 2007 Supplemental Report. The 2008 Study indicates that the upgrade will not be required until 2024 which is beyond the 10 year planning horizon. Similarly, the Fisher (Central Tie-Shady Grove Tap) 230 kV line reconductoring project was deferred from the 2016 timeframe indicated by the 2007 Collaborative Transmission Plan and the 2007 Supplemental Report. The 2008 Study indicates that the upgrade will not be required until 2020 which is also beyond the 10 year planning horizon. The line loading was impacted by the lower load growth assumption and lower base case loop flow. The line is sensitive to south to north transfers. Increased import from SOCO increases loading on the Fisher lines and can accelerate the need for an upgrade. Duke will continue to monitor the timing of these upgrades.

IV.F. Collaborative Transmission Plan

The 2008 Collaborative Transmission Plan includes 16 projects with an estimated cost of $10 million or more each. These projects are listed in Appendix B. This list of major projects will continue to be modified on an ongoing basis as new improvements are identified through the NCTPC Process and projects are completed or eliminated from the list. The list provides the following information for each project:

1) Reliability Project: Description of the project.

2) Issue Resolved: Specific driver for project.

3) Status: Status of development of the project as described below:

   a. *In-Service* – Projects with this status are in-service.
   b. *Underway* – Projects with this status range from the Transmission Owner having some money in its current year budget for the project to the Transmission Owner having completed some construction activities for the project.
   c. *Planned* – Projects with this status do not have money in the Transmission Owner's current year budget; and the project is subject to change.
   d. *Deferred* – Projects with this status were identified in the 2007 Supplemental Report and have been deferred beyond the end of the planning horizon based on the 2008 Study results.

4) Transmission Owner: Responsible equipment owner designated to design and implement the project.

5) Projected In-Service Date: The date the project is expected to be placed in service.

6) Estimated Cost: The estimated cost is in nominal dollars which reflects the sum of the estimated annual cash flows over the expected development period for the specific project (typically 2 – 5 years), including direct costs, loadings and overheads; but not including AFUDC. Each year's cash flow is escalated to the year of the expenditures. The sum of the expected cash flows is the estimated cost.

7) Project lead time: Number of years needed to complete project. For projects with the status of Underway, the project lead time is the time remaining to complete construction of the project and place the project in-service.

A detailed description of each of the 16 projects is provided in Appendix C.

V. Wind Sensitivity Results

The wind sensitivity case for the 2008 study modeled 250 MW of hypothetical wind generation in the eastern region of the Progress Energy service area, 300 MW in the Progress western region, and 200 MW in the Duke service area. All resources were studied as a MW injection and were modeled as tying into various substations on the existing 66 kV, 100/115 kV, and 230kV transmission system in 50 MW or 100 MW increments. Considerations such as permitting, legal restrictions (e.g. the ridgeline law), or the ability to site proposed projects were not taken into account in this analysis. This analysis was also based on a peak summer transmission case, and did not take into account all operational considerations associated with wind generation, such as stability and thermal issues during off-peak and intermediate load periods.

The study results did not produce any new thermal or voltage violations, and did not impact any projects in the NCTPC plan. Due to the distributed generation effect of these resources a number of contingencies in the base case had slightly improved thermal or voltage impacts. The specific hypothetical wind generation locations and MW injection levels are listed in Table 6.

Table 6 - Wind Sensitivity
2018 Hypothetical Wind Generation Scenarios Studied

Resource In (County)	Sink	Test Level (MW)
Pamlico	Bayboro 230 kV Sub	100 MW
Carteret	Beaufort 115 kV Sub	100 MW
Carteret	North River 115 kV Sub	50 MW
Madison	Cane River 230 kV Sub	50 MW
Buncombe	Black Mountain 115 kV Sub	50 MW
Buncombe	Oteen 115 kV Sub	50 MW
Transylvania	Haywood EMC Cradle of Forestry 115 kV Sub	50 MW
Haywood	Maggie Valley 115 kV Sub	50 MW
Madison	Marshall 115 kV Sub	50 MW
Jackson	Highlands 66 kV Sub	50 MW
Jackson	Sylva 66 kV Sub	50 MW
Swain	Whitier 66 kV Switch	50 MW
Swain	East Bryson 66 kV Sub	50 MW

VI. NERC TPL Standards Sensitivity Results

The TPL Standard sensitivity analysis evaluated the impact of a subset of proposed revisions to the TPL-001 through 004 standards. The impact of the following types of Extra High Voltage (EHV) system contingencies were analyzed:

- Loss of a 230 kV line, 500 kV line or 500/230 kV transformer, then loss of another 230 kV line, 500 kV line, or 500/230 kV transformer. Combinations including both Duke and PEC facilities were included. System adjustment between contingencies was allowed to mitigate the impact.
- Common tower and common breaker failure between two 230 kV or 500 kV elements.
- No loss of non-consequential load allowed;
- The results of the contingencies were evaluated against the applicable ratings and bus voltages below 0.91 per unit were identified.

For Duke, the results did not indicate any impact on 230 kV and above (EHV) planned projects or require new projects during the 10 year planning horizon. For the EHV, some contingencies would require operating guides to adjust generation between contingencies. Also there was no significant impact on the timing of projects on EHV facilities through the year 2030. Some contingencies studied would require operating guides to adjust generation between the first and second contingency, as allowed by the proposed standard. Through the year 2030, acceleration of projects would be required on Duke 100 kV facilities to mitigate the impact of the EHV contingencies that were studied. There were 38 projects identified that would be accelerated to enable the Duke transmission system to operate reliably under the impact of the contingencies studied. On average projects identified would require a 10 year acceleration, with the range of acceleration being from 2 years to greater than 14 years. The net present value of the acceleration is on the order of $80 to $100 million dollars.

For Progress, the EHV results indicated only one significant impact, for which a solution is currently being developed. Some contingencies would require operating guides, adjustments to generation between contingencies, and possibly minor line equipment upgrades. There were 32 projects on Progress' 115kV network that would be accelerated due to the EHV contingencies that were studied. The 32 projects have an average acceleration of 14 years and would be required to allow the Progress transmission system to operate reliably under the contingencies studied. The net present value of the accelerations is approximately $200 million dollars.

Appendix A
Interchange Tables

2013 SUMMER PEAK
DUKE ENERGY CAROLINAS
DETAILED INTERCHANGE

Duke Energy Carolinas Modeled Imports/Purchases - MW

	Base Case	PEC TRM	Fayetteville	Fayetteville TRM
CPLE (City of Seneca)	30	30	30	30
CPLE (NCEMC)	100	0	100	0
CPLE (NCEMC/Anson)	72	72	72	72
SCEG (City of Greenwood)	55	55	55	55
SCPSA (New Horizons/NHEC)	925	925	925	925
SEPA (Hartwell)	155	155	155	155
SEPA (Thurmond)	113	113	113	113
SOCO (EU2)	39	39	39	39
SOCO (NCMPA1)	50	50	50	50
SOCO (PMPA)	216	216	216	216
Total	**1755**	**1655**	**1755**	**1655**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM	Fayetteville	Fayetteville TRM
CPLE (Broad River)	850	850	850	850
CPLE (NCEMC)	200	200	200	200
CPLE (NCEMC#2/Catawba)	105	105	105	105
CPLE (PEC TRM Reserves)	0	511	0	511
CPLE (Rowan)	150	150	150	150
CPLE (Fayetteville)	0	0	500	500
DVP	100	100	100	100
SCEG (Orangeburg)	200	200	200	200
Total	**1605**	**2116**	**2105**	**2616**

Duke Energy Carolinas Net Interchange - MW

Base Case	PEC TRM	Fayetteville	Fayetteville TRM
-150	461	350	961

Note:
Positive net interchange indicates an export and negative interchange an import.

2013 SUMMER PEAK
PROGRESS ENERGY CAROLINAS (EAST)
DETAILED INTERCHANGE

Progress Energy Carolinas (East) Modeled Imports/Purchases - MW

	Base Case	PEC TRM	Fayetteville	Fayetteville TRM
AEP (NCEMC)	100	100	100	100
AEP (NCEMC#2)	100	100	100	100
AEP (PEC TRM)	0	97	0	97
CPLW	150	150	150	150
DUKE (Rowan)	150	150	150	150
DUKE (Broad River)	850	850	850	850
DUKE (NCEMC#2/Catawba)	105	105	105	105
DUKE (NCEMC)	200	200	200	200
DUKE (Fayetteville)	0	0	500	500
DUKE (PEC TRM)	0	511	0	511
DVP (PEC TRM)	0	835	0	835
DVP (SEPA-KERR)	95	95	95	95
SCEG (PEC TRM)	0	199	0	199
SCPSA (Co-Gen)	9	9	9	9
SCPSA (PEC TRM)	0	193	0	193
Total	**1759**	**3594**	**2259**	**4094**

Progress Energy Carolinas (East) Modeled Exports/Sales - MW

	Base Case	PEC TRM	Fayetteville	Fayetteville TRM
DUKE (City of Seneca)	30	30	30	30
DUKE (NCEMC)	100	0	100	0
DUKE (NCEMC/Anson)	72	72	72	72
DVP (Littleton)	9	9	9	9
DVP (NCEMPA)	161	161	161	161
DVP (PJM-Cravenwood)	47	47	47	47
Total	**419**	**319**	**419**	**319**

Progress Energy Carolinas (East) Net Interchange - MW

	Base Case	PEC TRM	Fayetteville	Fayetteville TRM
	-1340	-3275	-1840	-3675

Note:
Positive net interchange indicates an export and negative interchange an import.

2013 SUMMER PEAK
PROGRESS ENERGY CAROLINAS (WEST)
DETAILED INTERCHANGE

Progress Energy Carolinas (West) Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case	Fayetteville & TRM
TVA (SEPA)	1	1	1
AEP (Rockport)	100	100	100
Total	**101**	**101**	**101**

Progress Energy Carolinas (West) Modeled Exports/Sales - MW

	Base Case	PEC TRM Case	Fayetteville & TRM
CPLE	150	150	150
Total	**150**	**150**	**150**

Progress Energy Carolinas (West) Net Interchange - MW

	Base Case	PEC TRM Case	Fayetteville & TRM
Total	49	49	49

Note:
Positive net interchange indicates an export and negative interchange an import.

2018 SUMMER PEAK
DUKE ENERGY CAROLINAS
DETAILED INTERCHANGE

Duke Energy Carolinas Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
CPLE (City of Seneca)	31	31
CPLE (NCEMC)	100	0
CPLE (NCEMC/Anson)	200	200
SCEG (City of Greenwood)	57	57
SCPSA (New Horizons/NHEC)	1075	1075
SEPA (Hartwell)	155	155
SEPA (Thurmond)	113	113
SOCO (EU2)	124	124
SOCO (NCMPA1)	91	91
SOCO (PMPA)	286	286
Total	**2232**	**2132**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE (Broad River)	850	850
CPLE (NCEMC)	425	425
CPLE (NCEMC/Catawba)	105	105
CPLE (PEC TRM VACAR Reserves)	0	511
CPLE (Rowan)	150	150
DVP	50	50
SCEG (Orangeburg)	200	200
Total	**1780**	**2291**

Duke Energy Carolinas Net Interchange

Base Case	PEC TRM Case
-452	159

Note:
Positive net interchange indicates an export and negative interchange an import.

2018 SUMMER PEAK
PROGRESS ENERGY CAROLINAS (EAST)
DETAILED INTERCHANGE

Progress Energy Carolinas (East) Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
AEP (NCEMC)	100	100
AEP (NCEMC #2)	100	100
AEP (PEC TRM)	0	97
CPLW	150	150
DUKE (NCEMC)	425	425
DUKE (Broad River)	850	850
DUKE (NCEMC#2/Catawba)	105	105
DUKE (Rowan)	150	150
DUKE (PEC TRM VACAR Reserves)	0	511
DVP (PEC TRM)	0	835
DVP (SEPA-KERR)	95	95
SCEG (PEC TRM)	0	199
SCPSA (Co-Gen)	9	9
SCPSA (PEC TRM)	0	193
Total	**1984**	**3819**

Progress Energy Carolinas (East) Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
DUKE (City of Seneca)	31	31
DUKE (NCEMC)	100	0
DUKE (NCEMC/Anson)	200	200
DVP (Littleton)	12	12
DVP (NCEMPA)	175	175
DVP (PJM-Cravenwood)	47	47
Total	**565**	**465**

Progress Energy Carolinas (East) Net Interchange - MW

Base Case	PEC TRM Case
-1419	-3354

Note:
Positive net interchange indicates an export and negative interchange an import.

2018 SUMMER PEAK
PROGRESS ENERGY CAROLINAS (WEST)
DETAILED INTERCHANGE

Progress Energy Carolinas (West) Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
TVA (SEPA)	1	1
AEP (Rockport)	100	100
Total	**101**	**101**

Progress Energy Carolinas (West) Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE	150	150
Total	**150**	**150**

Progress Energy Carolinas (West) Net Interchange – MW

	Base Case	PEC TRM Case
	49	**49**

Note:
Positive net interchange indicates an export and negative interchange an import.

Appendix B
Collaborative Transmission Plan Major Project Listing

2008 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date**	**Estimated Cost ($M)[2]**	**Project Lead Time (Years)[3]**
0005	Rockingham-West End 230 kV Line, Construct Wadesboro Bowman School 230 kV Tap, Uprate line	Address loading on Rockingham-Blewett-Tillery 115 kV corridor	Underway	Progress	6/1/2009	12	<1
0007	Richmond 500 kV Substation, Install 500 kV series reactor in Richmond-Newport 500 kV Line	Address large post contingency phase angle differences at times of high 500 kV flow	Underway	Progress	12/1/2009	12	1.5
0004	Clinton-Lee 230kV Line, Construct line	Address loading on Clinton-Vander 115 kV line & Lee Sub-Wallace 115 kV line	Underway	Progress	6/1/2010	25	1.5
0011	Asheville-Enka, Convert 115 kV Line to 230 kV, Construct new 115 kV line	Address Asheville 230/115 kV transformer loading	Underway	Progress	12/1/2010 12/1/2012	30	1.5 3.5
0010	Rockingham-West End 230kV East Line, Construct line	Address loading on Rockingham-West End 230 kV Line	Underway	Progress	6/1/2011	32	2.5
0010A	Harris Plant-RTP 230 kV Line, Establish a new 230 kV line by utilizing the Amberly 230kV Tap, converting existing Green Level 115kV Feeder to 230 kV operation, construction of new 230 kV line, remove 230/115 kV transformation and connection at Apex US1	Address the need for new transmission source to serve rapidly growing load in the western Wake County area; helps address loading on Cary Regency Park-Durham 230 kV line	Underway	Progress	6/1/2011	65	2.5
0010B	Asheboro-Pleasant Garden 230 kV Line, Construct new line, at Asheboro replace 2-200 MVA 230/115 kV Banks with 2-300 MVA Banks	Address loading on Badin-Tillery l00kV lines, Biscoe-Asheboro 115 kV line, Tillery-Biscoe 115 kV corridor, Newport-Richmond 500 kV line, Wake 500/230 banks	Underway	Progress & Duke	6/1/2011	49	2.5

2008 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date**	**Estimated Cost ($M)[2]**	**Project Lead Time (Years)[3]**
0018	Rockingham-Lilesville 230 kV Line, Add third line	Address loading on Lilesville-Rockingham 230 kV lines	Underway	Progress	6/1/2011	23	2.5
0021	Richmond-Ft Bragg Woodruff Street 230 kV Line	Address loading of several transmission lines out of the Richmond/Rockingham area due to Richmond Co. Combined Cycle generator	Underway	Progress	6/1/2011	85	2.5
0022	Jacksonville Static VAR Compensator	Address inadequate dynamic voltage recovery after system faults during periods of high imports	Planned	Progress	6/1/2012	30	3.5
0008	Greenville-Kinston Dupont 230 KV Line , Construct line	Address loading on Greenville-Everetts 230 kV Line	Planned	Progress	6/1/2013	25	4.0
0023	Folkstone 230/115kV Substation	Address voltage on Castle Hayne-Jacksonville City 115kV Line	Planned	Progress	6/1/2013	21	4.0
0016	Wake 500 kV Sub, Add 3rd 500/230 kV Transformer Bank	Address loading on existing Wake 500/230 banks	Planned	Progress	6/1/2013	46	4.0
0024	Durham-RTP 230kV Line, Reconductor	Address loading on the Durham-RTP 230kV Line	Planned	Progress	6/1/2014	22	4.0

2008 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date**	**Estimated Cost ($M)[2]**	**Project Lead Time (Years)[3]**
0019	Cape Fear-West End 230 kV West Line, Install a 230 kV Series Reactor at West End 230 kV Sub	Address loading on Rockingham-West End 230 kV and Cape Fear-West End 230 kV lines	Planned	Progress	6/1/2016	17	4.0
0025	Sadler Tie-Glen Raven Main Circuit 1 & 2 (Elon 100 kV Lines), Reconductor	Following construction of additional generation at Dan River Steam Station, contingency loading of the remaining line on loss of the parallel line	Planned	Duke	6/1/2011	26	3.0
						520	

[1] Status:

Underway: Projects with this status range from the Transmission Owner having some money in its current year budget for the project to the Transmission Owner having completed some construction activities for the project.
Planned: Projects with this status do not have money in the Transmission Owner's current year budget; and the project is subject to change.

[2] The estimated cost is in nominal dollars which reflects the sum of the estimated annual cash flows over the expected development period for the specific project (typically 2 – 5 years), including direct costs, loadings and overheads; but not including AFUDC. Each year's cash flow is escalated to the year of the expenditures. The sum of the expected cash flows is the estimated cost.

[3] For projects with a status of Underway, the project lead time is the time remaining to complete construction and place in-service.

Appendix C
Collaborative Transmission Plan Major Project Descriptions

Table of Contents

Note: The estimated cost for each of the projects described in Appendix C is in nominal dollars which reflects the sum of the estimated annual cash flows over the expected development period for the specific project (typically 2 – 5 years), including direct costs, loadings and overheads; but not including AFUDC. Each year's cash flow is escalated to the year of the expenditures. The sum of the expected cash flows is the estimated cost.

Project ID and Name: 0005 - Rockingham-West End 230 kV Line, Wadesboro Bowman School Tap

Project Description
This project consist of construction 12 miles of new 230 kV to establish a new tap off of the Rockingham-West End 230 kV Line to serve two 115 kV deliveries to be converted to 230 kV. Also a section of the Rockingham-West End 230 kV Line will be uprated to its full conductor rating between Rockingham and the new tap.

Status	Underway: Project is on schedule. Right-of-way acquisition is complete.
Transmission Owner	Progress
Planned In-Service Date	6/1/2009
Estimated Time to Complete	<1.0 year
Estimated Cost	$12 M

Narrative Description of the Need for this Project
With the Harris unit down an outage of the Rockingham terminal of the Rockingham-Biscoe 230 kV line will cause the Rockingham-Blewett-Tillery 115 kV corridor to exceed its rating.

Other Transmission Solutions Considered
Rebuild, reconductor existing line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0007 - Richmond 500 kV Series Reactor

Project Description
This project consists of installing a 500 kV series reactor at the Richmond 500 kV Substation. The reactor will be in series with the Richmond-Newport 500 kV line.

Status	Underway: Conceptual design is complete, equipment has been purchased
Transmission Owner	Progress
Planned In-Service Date	12/1/2009
Estimated Time to Complete	1.5 years
Estimated Cost	$12 M

Narrative Description of the Need for this Project
This project is needed to permit closing of the Newport-Richmond 500 kV line at times of high import flow mitigating issues with large post contingency phase angle.

Other Transmission Solutions Considered
Intermediate 500 kV substation. Additional 500 kV transmission line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0004 - Clinton-Lee 230 kV Line

Project Description
This project consists of construction 29 miles of new 230 kV line between Lee and Clinton.

Status	Underway: Contingency loading in recent studies has been lower than in previous studies allowing for this project to be delayed one year to 2010.
Transmission Owner	Progress
Planned In-Service Date	6/1/2010
Estimated Time to Complete	1.5 years
Estimated Cost	$25 M

Narrative Description of the Need for this Project
With an outage of the Erwin terminal of the Erwin-Clinton 230 kV line or an outage of the Clinton terminal of the Clinton-Wallace 230 kV line will cause several area 115 kV line to exceed their rating.

Other Transmission Solutions Considered
Rebuild, reconductor existing line.

Why this Project was Selected as the Preferred Solution
Cost, feasibility and improved area voltage.

Project ID and Name: 0011 - Asheville-Enka

Project Description
First phase of project will convert the Asheville-Enka 115 kV West Line to 230 kV operation and establish Enka 230kV Substation by installing 1-300MVA, 230/115kV transformer at the Enka 115kV Switching Station site. The second phase of the project consists of constructing approximately 10 miles of 3-1590 MCM ACSR for 115 kV operation between Asheville Plant and Enka 230 kV Substations.

Status	Underway: Project is on schedule. Conceptual Design Underway.
Transmission Owner	Progress
Planned In-Service Date	12/1/2010, conversion of existing line 12/1/2012, construction of new line
Estimated Time to Complete	1.5 years for conversion, 3.5 years for new line
Estimated Cost	$30 M

Narrative Description of the Need for this Project
With an Asheville unit down an outage of one 230/115 kV transformer at Asheville 230 kV will cause the remaining transformer to exceed its rating. After the line is converted in 2010 there is a need construct a new 115kV Line to unload the remaining 115kV lines out of Asheville S.E. Plant.

Other Transmission Solutions Considered
Replace Asheville 230/115 kV transformers with higher rated transformers.

Why this Project was Selected as the Preferred Solution
Effective solution.

Project ID and Name: 0010 - Rockingham-West End 230 kV East Line

Project Description
This project consists of constructing 38 miles of new 230 kV line between Rockingham and West End 230 kV Substations.

Status	Underway: Project is on schedule, right-of-away acquisition in progress.
Transmission Owner	Progress
Planned In-Service Date	6/1/2011
Estimated Time to Complete	2.5 years
Estimated Cost	$32 M

Narrative Description of the Need for this Project
With the Harris unit down an outage of the Richmond-Cumberland 500 kV line will cause the existing Rockingham-West End 230 kV line to exceed its rating.

Other Transmission Solutions Considered
Rebuild, reconductor existing line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0010A - Harris-RTP 230 kV Line

Project Description
Construct the Harris-RTP 230 kV Line. Develop RTP 230 kV Switching Substation at or near the existing Amberly 230 kV tap on the Cary Regency Park-Durham 230 kV line. Construct 7 miles of new 230 kV line between Amberly 230/23 kV and Green Level 115/23 kV using 6-1590 MCM ACSR and convert Green Level 115 kV Substation to 230/23 kV. Convert the existing Apex US 1– Green Level 115 kV Feeder (approximately 7 miles) to 230 kV using 6-1590 MCM ACSR and remove the termination at Apex US #1. From the termination point removed at Apex US #1, continue with 4 miles of new 230 kV construction to the Harris 230 kV Switchyard using 6-1590 MCM ACSR.

Status	Underway: Engineering & Construction in progress.
Transmission Owner	Progress
Planned In-Service Date	6/1/2011
Estimated Time to Complete	2.5
Estimated Cost	$65 M

Narrative Description of the Need for this Project
This project is needed to serve rapidly growing load in the western Wake County area.

Other Transmission Solutions Considered
Construct Harris-Durham 230 kV line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0010B - Asheboro (PEC)-Pleasant Garden (DE) 230kV Line, Replace Asheboro 230/115 kV Transformers

Project Description
Construct the (PEC)Asheboro-(DE)Pleasant Garden 230 kV tie line between Progress Energy and Duke Energy. Construct 20 miles of new 230 kV line using 6-1590 MCM ACSR. At Asheboro 230 kV Substation replace 2-200MVA 230/115 kV transformers with 2-300 MVA 230/115 kV transformers.

Status	Underway: Right-of-way acquisition underway.
Transmission Owner	Progress & Duke
Planned In-Service Date	6/1/2011
Estimated Time to Complete	2.5 years
Estimated Cost	$49 M

Narrative Description of the Need for this Project
This project is needed to address contingency voltage issues in the Asheboro area, relieve loadings on the Biscoe/Asheboro and Tillery/Badin corridors and loading in the Raleigh/Durham area lines.

Other Transmission Solutions Considered
Construct Parkwood-Durham 500 kV line, Harris-Durham 230 kV line, Cape Fear-Siler City 230 kV line, and/or Buck-Asheboro 230 kV line.

Why this Project was Selected as the Preferred Solution
Defers the Cape Fear-Siler City 230 kV line beyond the 10 year planning horizon. Addresses several transmission issues including some that the Cape Fear-Siler City 230 kV line did not address. Cost same as Cape Fear-Siler City 230 kV line.

Project ID and Name: 0018 - Rockingham-Lilesville 230 kV Line

Project Description
Construct approximately 14 miles of 3-1590 MCM ACSR between Rockingham 230kV Sub and Lilesville 230kV Sub.

Status	Underway: Right-of-way acquisition is in progress.
Transmission Owner	Progress
Planned In-Service Date	6/1/2011
Estimated Time to Complete	2.5 years
Estimated Cost	$23 M

Narrative Description of the Need for this Project
By the summer of 2011, with the Harris unit down, the outage of the Richmond-Newport 500kV Line will cause an overload on the Rockingham-Lilesville Black and White 230kV Lines.

Other Transmission Solutions Considered
Reconductor the Rockingham-Lilesville Black and White 230kV Lines.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0021 - Richmond- Ft. Bragg Woodruff Street 230kV Line

Project Description
Construct approximately 65 miles of 6-1590 MCM ACSR between Richmond 500kV Sub and Ft. Bragg Woodruff Street 230kV Sub.

Status	Underway: Route has been selected. Right-ofway acquisition in progress.
Transmission Owner	Progress
Planned In-Service Date	6/1/2011
Estimated Time to Complete	2.5 years
Estimated Cost	$85 M

Narrative Description of the Need for this Project
By summer 2011, with a large unit down and the installation of Richmond CC, there are several contingencies that will cause 230kV lines around Richmond, Rockingham, and Fayetteville to approach or exceed their thermal ratings.

Other Transmission Solutions Considered
Construct a second Richmond-Cumberland 500kV Line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0022 - Jacksonville Static VAr Compensator (SVC)

Project Description
Install a 300MVAR 230kV Static VAR Compensator (SVC) at the Jacksonville 230kV Substation.

Status	Planned
Transmission Owner	Progress
Planned In-Service Date	6/1/2012
Estimated Time to Complete	3.5 years
Estimated Cost	$30 M

Narrative Description of the Need for this Project
This project was identified during a dynamic evaluation of PEC's East System during periods of increased imports. The analysis indicated that under certain faulted conditions that PEC East's transmission network along the coast of NC would be unable to maintain adequate voltage support. The lack of voltage support in the coastal area means that voltage recovery following certain faults is inadequate to maintain proper voltage.

Other Transmission Solutions Considered
N/A

Why this Project was Selected as the Preferred Solution
Only viable solution

Project ID and Name: 0008 - Greenville-Kinston DuPont 230 kV Line

Project Description
This project consists of constructing 30 miles of 230 kV line between Greenville and Kinston DuPont 230 kV Substations.

Status	Planned: All right-of-way has been acquired.
Transmission Owner	Progress
Planned In-Service Date	6/1/2013
Estimated Time to Complete	4 years
Estimated Cost	$25 M

Narrative Description of the Need for this Project
With a Brunswick unit down an outage of the Wilson-Greenville 230 kV line will cause the Greenville-(DVP) Everetts 230 kV line to exceed its rating.

Other Transmission Solutions Considered
Rebuild, reconductor existing line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0023 - Folkstone 230/115kV Substation

Project Description
Construct the new Folkstone 230kV Substation, loop-in the Castle Hayne-Jacksonville 230kV line and connect to the Castle Hayne-Jacksonville City 115kV line. This project will require the construction of approximately 16 miles of 115kV and the installation of a 200 MVA 230/115 transformer.

Status	Planned
Transmission Owner	Progress
Planned In-Service Date	6/1/2013
Estimated Time to Complete	4 years
Estimated Cost	$21 M

Narrative Description of the Need for this Project
An outage of either of the Castle Hayne or Jacksonville terminals of the Castle Hayne-Jacksonville 115kV line will cause voltage along the line to drop below planning criteria.

Other Transmission Solutions Considered
Reconductor existing line

Why this Project was Selected as the Preferred Solution
Cost, feasibility, and long term effectiveness.

Project ID and Name: 0016 - Wake 500/230 kV Bank #3

Project Description
This project consists of installing a third 500/230 kV 1000MVA transformer bank at Wake 500 kV Substation.

Status	Planned
Transmission Owner	Progress
Planned In-Service Date	6/1/2013
Estimated Time to Complete	4 years
Estimated Cost	$46 M

Narrative Description of the Need for this Project
With the Harris unit down an outage of one of the existing two Wake 500/230 kV banks causes the remaining bank to exceed its rating.

Other Transmission Solutions Considered
Replace existing two Wake 500/230 kV banks with higher rated banks.

Why this Project was Selected as the Preferred Solution
Cost, feasibility and provides benefits to transfer capability.

Project ID and Name: 0024 - Durham-RTP 230kV Line, Reconductor

Project Description
Reconductor approximately 10 miles of 230kV Line with 6-1590.

Status	Planned
Transmission Owner	Progress
Planned In-Service Date	6/1/2014
Estimated Time to Complete	4 years
Estimated Cost	$22 M

Narrative Description of the Need for this Project
By the summer of 2014 with Harris Plant down, a common tower outage of the Method-(DPC) East Durham and the Durham-Method 230kV Lines will cause an overload of the Durham 500kV Sub- RTP 230kV Switching Station Line.

Other Transmission Solutions Considered
Construct a new line between Durham and RTP 230kV Subs.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0019 - Cape Fear-West End 230 kV Line, Series Reactor

Project Description
Install 230kV series reactor at or near the West End terminal of the Cape Fear Plant-West End 230kV Line.

Status	Planned
Transmission Owner	Progress
Planned In-Service Date	6/1/2016
Estimated Time to Complete	4 years
Estimated Cost	$17 M

Narrative Description of the Need for this Project
By the summer of 2016, with the Harris unit down, the loss of the Richmond-Cumberland 500kV Line will cause the Cape Fear-West End 230kV Line to overload.

Other Transmission Solutions Considered
Reconductor the Cape Fear-West End 230kV Line.

Why this Project was Selected as the Preferred Solution
Cost and feasibility.

Project ID and Name: 0025 - Sadler Tie – Glen Raven Main 100 kV Lines

Project Description
The project consists of reconductoring 22 miles of the existing Elon Line (336 and 954 ACSR conductor) with bundled 954 ACSR conductor from Sadler Tie to Glen Raven Main.

Status	Planned: Engineering work being performed at this time. Generation interconnection studies indicate an in-service date of 2011.
Transmission Owner	Duke
Planned In-Service Date	2011
Estimated Time to Complete	3 years
Estimated Cost	$26 M

Narrative Description of the Need for this Project
Flow on the 100 kV lines to the south of the Dan River Steam Station is impacted by the amount of generation dispatched at Dan River and Rockingham. Loss of one circuit of the double circuit line causes increased loading on the remaining line. The construction of a 620 MW combined cycle unit at Dan River drives the need to reconductor the line.

Other Transmission Solutions Considered
Conversion of a line to 230 kV to support the planned generation in the area.

Why this Project was Selected as the Preferred Solution
Selected most cost effective solution and needed to support timing of generation projects.

Appendix D
Collaborative Plan Comparisons

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2007 Supplemental Plan[1]			2008 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
0002	Lee Sub-Wommack 230 kV South Line, Reconductor	Address loading on Lee-Wommack 230 kV South line	Progress	Underway	6/1/2008	13	In-service	---	---
0003	Durham 500 KV Sub, Loop Mayo Plant-Wake 500 KV Line	Address loading on Wake 500/230 transformer banks	Progress	Underway	6/1/2008	31	In-service	---	---
0017	Durham-Falls 230 kV Line, Construct line	Address loading on Method-East Durham 230 kV line	Progress	Underway	6/1/2008	10	In-service	---	---
0005	Rockingham-West End 230 kV Line, Construct Wadesboro Bowman School 230 kV Tap, Uprate line	Address loading on Rockingham-Blewett-Tillery 115 kV corridor	Progress	Underway	6/1/2009	11	Underway	6/1/2009	12
0007	Richmond 500 kV Substation, Install 500 kV series reactor in Richmond-Newport 500 kV Line	Address large post contingency phase angle differences at times of high 500 kV flow	Progress	Underway	12/1/2009	10	Underway	12/1/2009	12
0004	Clinton-Lee 230kV Line, Construct line	Address loading on Clinton-Vander 115 kV line & Lee Sub-Wallace 115 kV line	Progress	Underway	6/1/2010	21	Underway	6/1/2010	25
0011	Asheville-Enka, Convert 115 kV Line to 230 kV, Construct new 115 kV line	Address Asheville 230/115 kV transformer loading	Progress	Planned	12/1/2010 12/1/2012	28	Underway	12/1/2010 12/1/2012	30
0010	Rockingham-West End 230kV East Line, Construct line	Address loading on Rockingham-West End 230 kV Line	Progress	Underway	6/1/2011	32	Underway	6/1/2011	32

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2007 Supplemental Plan[1]			2008 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
0010A	Harris Plant-RTP 230 kV Line, Establish a new 230 kV line by utilizing the Amberly 230kV Tap, converting existing Green Level 115kV Feeder to 230 kV operation, construction of new 230 kV line, remove 230/115 kV transformation and connection at Apex US1	Address the need for new transmission source to serve rapidly growing load in the western Wake County area; helps address loading on Cary Regency Park-Durham 230 kV line	Progress	Underway	6/1/2011	56	Underway	6/1/2011	65
0010B	Asheboro-Pleasant Garden 230 kV Line, Construct new line, at Asheboro replace 2-200 MVA 230/115 kV Banks with 2-300 MVA Banks	Address loading on Badin-Tillery l00kV lines, Biscoe-Asheboro 115 kV line, Tillery-Biscoe 115 kV corridor, Newport-Richmond 500 kV line, Wake 500/230 banks	Progress & Duke	Underway	6/1/2011	42	Underway	6/1/2011	49
0018	Rockingham-Lilesville 230 kV Line, Add third line	Address loading on Lilesville-Rockingham 230 kV lines	Progress	Underway	6/1/2011	19	Underway	6/1/2011	23
0021	Richmond-Ft Bragg Woodruff Street 230 kV Line	Address loading of several transmission lines out of the Richmond/Rockingham area due to Richmond Co. Combined Cycle generator	Progress	Planned	6/1/2011	85	Underway	6/1/2011	85
0022	Jacksonville Static VAR Compensator	Address inadequate dynamic voltage recovery after system faults during periods of high imports	Progress	Planned	6/1/2012	30	Planned	6/1/2012	30
0008	Greenville-Kinston Dupont 230 KV Line , Construct line	Address loading on Greenville-Everetts 230 kV Line	Progress	Underway	6/1/2011	19	Planned	6/1/2013	25

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2007 Supplemental Plan[1]			2008 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
0023	Folkstone 230/115kV Substation	Address voltage on Castle Hayne-Jacksonville City 115kV Line	Progress				Planned	6/1/2013	21
0016	Wake 500 kV Sub, Add 3rd 500/230 kV Transformer Bank	Address loading on existing Wake 500/230 banks	Progress	Planned	6/1/2013	23	Planned	6/1/2013	46
0024	Durham-RTP 230kV Line, Reconductor	Address loading on the Durham-RTP 230kV Line	Progress				Planned	6/1/2014	22
0019	Cape Fear-West End 230 kV West Line, Install a 230 kV Series Reactor at West End 230 kV Sub	Address loading on Rockingham-West End 230 kV and Cape Fear-West End 230 kV lines	Progress	Planned	6/1/2016	12	Planned	6/1/2016	17
0013	Replace Antioch 500/230 kV transformers #1 & #2	Contingency loading of the remaining Antioch bank on loss of the parallel bank	Duke	Planned	2013	52	Deferred	--	---
0020	Reconductor Fisher 230 kV Lines (Central-Shady Grove Tap #1 & #2)	Contingency loading of the remaining line on loss of the parallel line when Cliffside 5 is off line	Duke	Planned	2016	29	Deferred	---	---
0025	Sadler Tie-Glen Raven Main Circuit 1 & 2 (Elon 100 kV Lines), Reconductor	Following construction of additional generation at Dan River Steam Station, contingency loading of the remaining line on loss of the parallel line	Duke	---	---	--	Planned	6/1/2011	26
TOTAL						**523**			**520**

[1] Information reported in Appendix A to the "Supplemental Report on the NCTPC 2007 Collaborative Transmission Plan" dated May 16, 2008.

[2] Status:

In-service: Projects with this status are in-service.
Underway: Projects with this status range from the Transmission Owner having some money in its current year budget for the project to the Transmission Owner having completed some construction activities for the project.
Planned: Projects with this status do not have money in the Transmission Owner's current year budget; and the project is subject to change.
Deferred: Projects with this status were identified in the 2007 Supplemental Report and have been deferred beyond the end of the planning horizon based on analysis performed to develop the 2008 Collaborative Transmission Plan.

[3] The estimated cost is in nominal dollars which reflects the sum of the estimated annual cash flows over the expected development period for the specific project (typically 2 – 5 years), including direct costs, loadings and overheads; but not including AFUDC. Each year's cash flow is escalated to the year of the expenditures. The sum of the expected cash flows is the estimated cost.

Appendix E
Acronyms

ACRONYMS

AEP	American Electric Power
AFUDC	Allowance for Funds Used During Construction
CPLE	Carolina Power & Light East
CPLW	Carolina Power & Light West
DE	Duke Energy
DNR	Designated Network Resource
DVP	Dominion Virginia Power
ERAG	Eastern Interconnection Reliability Assessment Group
ETAP	Enhanced Transmission Access Planning
EU2	EnergyUnited
kV	Kilovolt
LSE	Load Serving Entity
LTSG	SERC Long-Term Study Group
M	Million
MMWG	Multiregional Modeling Working Group
MVA	megavolt-ampere
MW	Megawatt
NC	North Carolina
NCEMC	North Carolina Electric Membership Corporation
NCEMPA	North Carolina Eastern Municipal Power Agency
NCMPA1	North Carolina Municipal Power Agency Number 1
NCTPC	North Carolina Transmission Planning Collaborative
NERC	North American Electric Reliability Council
NHEC	New Horizons Electric Cooperative
OASIS	Open Access Same-time Information System
OATT	Open Access Transmission Tariff
OSC	Oversight Steering Committee
OTDF	Outage Transfer Distribution Factor
PEC	Progress Energy Carolinas, Inc.
PJM	PJM Interconnection, LLC
PMPA	Piedmont Municipal Power Agency
PSS/E	Power System Simulator for Engineering
PWG	Planning Working Group
RTP	Research Triangle Park
SCEG	South Carolina Electric & Gas Company
SCPSA	South Carolina Public Service Authority

SEPA	South Eastern Power Administration
SERC	SERC Reliability Corporation
SOCO	Southern Company
TAG	Transmission Advisory Group
TRM	Transmission Reliability Margin
TTC	Total Transfer Capability
TVA	Tennessee Valley Authority
VACAR	Virginia-Carolinas Reliability Agreement