North Carolina Transmission Planning Collaborative

Report on the NCTPC 2009-2019 Collaborative Transmission Plan

December 15, 2009
FINAL DRAFT

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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 2008-2018 Collaborative Transmission Plan (the "2008 Collaborative Transmission Plan" or the "2008 Plan") was published in January 2009

This report documents the current 2009 – 2019 Collaborative Transmission Plan ("2009 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 2009 reliability planning study scope and methodology. The NCTPC Process document and 2009 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 2009 NCTPC Process (Figure 2 in Section III) focused exclusively on the Reliability Planning Process because stakeholders did not request any Enhanced Transmission Access scenarios for the 2009 Study. Enhanced Transmission Access scenarios will again be solicited for the 2010 Study and included if appropriate.

The scope of the Reliability Planning Study included a base reliability analysis as well as analysis of potential resource supply options. The purpose of the base reliability study was to evaluate the transmission system's ability to meet load growth projected for 2010 through 2019 with the Participants' planned Designated Network Resources ("DNRs"). The purpose of the resource supply options analysis was to evaluate transmission system impacts for various resource supply options to meet future native load requirements. All resource supply options were proposed and analyzed for a start date of 2019.

The latter sections of the report and the corresponding appendices detail the base reliability analysis and sensitivity results and the specifics of the 2009 Plan resulting from the base reliability analysis. The NCTPC reliability study results affirmed that the planned Duke and Progress transmission projects prescribed in the 2008 Plan satisfactorily address the reliability concerns identified in the 2009 Study for the near-term (5 year) and the long-term (10 year) planning horizons.

The 2009 Plan is detailed in Appendix B which identifies the projects planned with an estimated cost of greater than $10 million. Projects in the 2009 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 total estimated cost for the 18 projects included in the 2009 Plan is $595 million. Appendix D provides a comparison of this year's Plan to the 2008 Plan.

The new or modified projects for Progress in the 2009 Collaborative Transmission Plan include:

- Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing

- Delayed several in-service dates due to changes in load forecasts[1] for Progress Energy as shown in Table 1 below [these project delays were reviewed internally and determined by Progress Energy after the load forecasts had been established for the 2009 Collaborative study]

Table 1: Progress Delayed Projects

Project	2009 Plan In-Service Date	2008 Plan In-Service Date
Clinton-Lee 230 kV Line	12/1/2011	6/1/2010
Harris Plant – RTP 230 kV Line	6/1/2014	6/1/2011
Greenville-Kinston Dupont 230 kV Line	6/1/2017	6/1/2011
Wake 500 kV Sub, Add 3rd 500/230 kV Transformer	6/1/2018	6/1/2013

[1] The changes in load forecasts are a result of the recent economic downturn and enhanced energy efficiency efforts. The rate of load growth in the Carolinas is expected to be lower than in the past. Overall there is still a positive load growth, although by the year 2014, Progress Energy is forecasting a 670 MW reduction in load from its prior forecast in its Eastern Area. The Progress Western Area is predicted to grow at a faster pace than earlier projected which is adding 87 MW to its prior peak forecast. Similarly Duke Energy is forecasting overall slower growth and is forecasting an approximate 1000 MW reduction in its 2014 load from its prior forecast.

Durham-RTP 230 kV Line, Reconductor	6/1/2019	6/1/2014
Cape Fear-West End 230 kV West Line	6/1/2019	6/1/2016
Rockingham-Lilesville 230 kV Line, Add 3rd Line	06/1/2019	6/1/2011

The new projects for Duke in the 2009 Plan include:

- Reconductor Pisgah Tie-Shiloh Switching Station 230 kV lines
- Reconductor Central Tie-Shady Grove Tap 230 kV lines
- Reconductor Peach Valley Tie-Riverview Switching Station 230 kV lines

For the 2009 Study, thirteen resource supply option scenarios involving hypothetical transfers of various MW quantities from neighboring systems into Duke or Progress East were studied. One transfer from Progress East to Dominion Virginia Power in PJM was also evaluated. The resulting analysis of the resource supply options showed that, with the exception of the SCEG to Duke 600 MW transfer, all transfer scenarios analyzed on the Duke and Progress East transmission systems can be accommodated without additional projects beyond those planned as a result of the base reliability study.

In addition to the transfer scenarios, the 2009 study also evaluated two generator resource supply option scenarios that incorporated hypothetical new base load plants into the Duke and Progress East areas. Only one additional project beyond those identified in the base reliability study was required to accommodate the plant in the Duke area, and no additional projects were required for the plant in the Progress East area. Tables 2 and 3 provide a summary of the resource supply analyses, including the incremental costs for upgrades needed to accommodate the resource supply options above the costs for facility additions and upgrades identified in the 2009 Collaborative Transmission Plan in Appendix B.

Table 2[2]
Resource Supply Option Results
2019 Hypothetical Transfer Scenarios Studied

Resource From	Sink	Test Level (MW)	Estimated Cost ($M)
NORTH – PJM (AEP)	Duke	600	0
SOUTH - SOCO	Duke	600	0
SOUTH – SCEG	Duke	600	129
SOUTH – SCPSA	Duke	600	0
EAST – Progress	Duke	600	0
WEST - TVA	Duke	600	0
NORTH – PJM (AEP)	Progress (CPLE)	600	0
NORTH – PJM (DVP)	Progress (CPLE)	600	0
SOUTH – SCEG	Progress (CPLE)	600	0
SOUTH – SCPSA	Progress (CPLE)	600	0
WEST - Duke	Progress (CPLE)	600	0
NORTH – PJM (AEP/AEP)	Duke / Progress (CPLE)	600 / 600	0/0
NORTH – PJM (AEP/DVP)	Duke / Progress (CPLE)	600 / 600	0/0
EAST - Progress	PJM (Dominion)	600	0

Table 3
Resource Supply Options
2019 Hypothetical Nuclear Generation Scenarios Studied

Company	Location (County)	MWs	Estimated Cost ($M)
Duke	Cherokee, SC	**1160**	15
Progress	Wake, NC	**1125**	N/A

In this NCTPC Process, the Participants validated and continued to build on the information learned from previous years' 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.

[2] In Table 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. Also, the projects required to accommodate each resource supply option were determined independently. Therefore, the projects and cost estimates do not reflect the requirements for simultaneously accommodating two or more resource supply options.

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 (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 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 First Revised Participation Agreement dated February 11, 2008 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 results of the Reliability Planning Process include 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, and the TAG participants are given an opportunity to provide comments on the results. All TAG feedback is reviewed by the OSC for consideration for incorporation into the final Collaborative Transmission Plan.

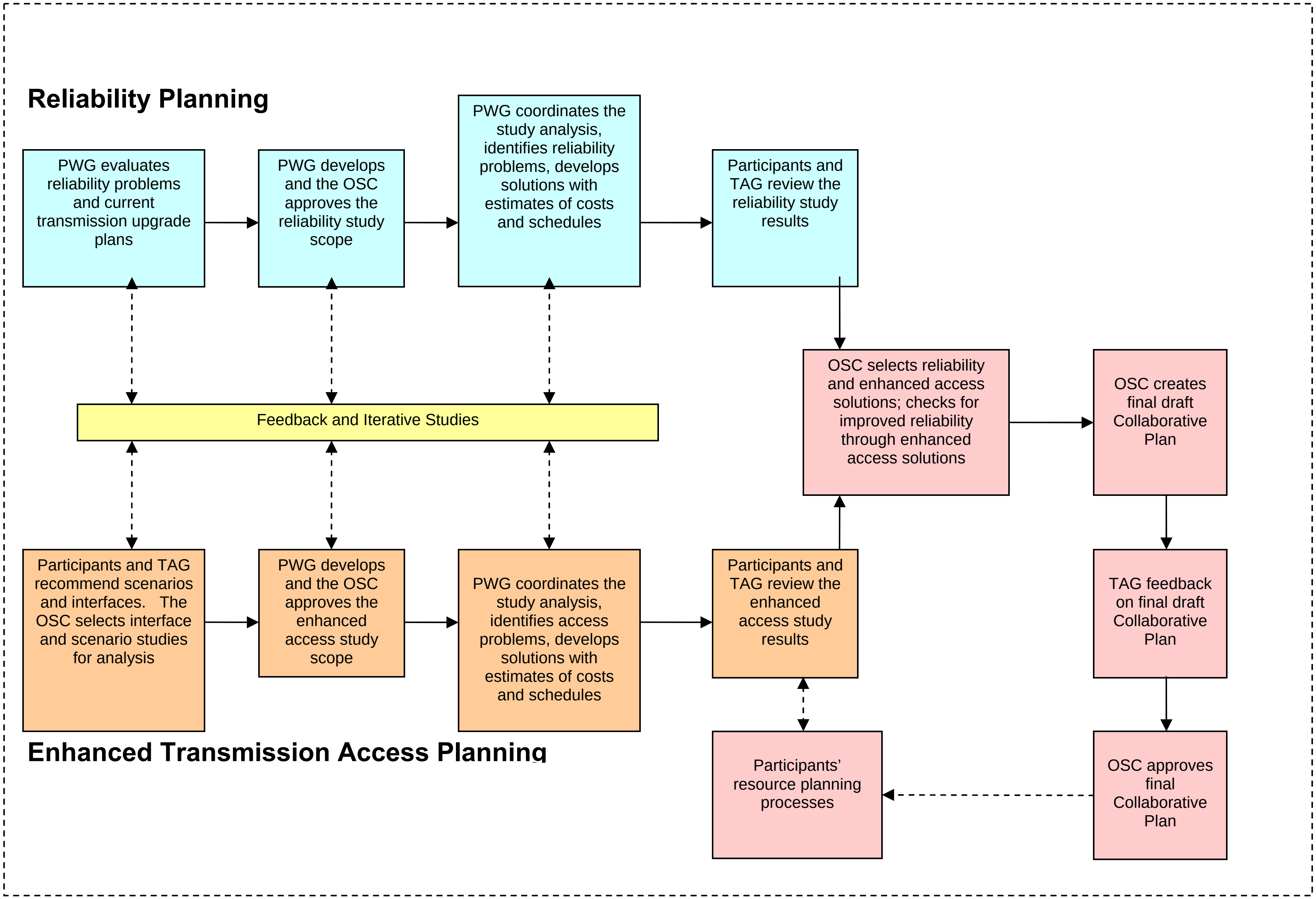
II.C. Enhanced Transmission Access Planning Process

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.

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 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, and the TAG participants are given an opportunity to provide comments on the results. All TAG feedback is reviewed by the OSC for consideration for incorporation into the final Collaborative Transmission Plan.

Figure 1
2009 NCTPC Process Flow Chart



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. This plan is reviewed with the TAG, and the TAG participants are given an opportunity to provide comments. All TAG feedback is reviewed by the OSC for consideration for incorporation into the final Collaborative Transmission Plan.

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. 2009 Reliability Planning Study Scope & Methodology

The 2009 Reliability Planning Process included a base reliability study, sensitivity analysis, and analysis of resource supply options. 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 2014 through 2019 with the Participants' planned Designated Network Resources ("DNRs"). The 2009 Study allowed for identification of any new system impacts not currently addressed by existing transmission plans in which case solutions were developed. The 2009 Study also allowed for adjustments to existing plans where necessary.

In addition to the base analysis, two sensitivity analyses were performed on the 2014 study year. The first sensitivity evaluated the impact of using available transmission reservations across the Duke system to transfer power from the Progress East area to the Progress West area under summer conditions. Real time scheduling of confirmed transmission reservations can be dynamic in nature. For that reason, it was necessary to assess the impact of higher import into Progress West in the summer. An alternative 2014 summer case that incorporated that higher summer import was developed and analyzed. The second sensitivity evaluated the impact of using high temperature conductor for the reconductor of the Caesar 230 kV Line from Pisgah Tie to Shiloh Switching Station instead of the bundled 954 ACSR conductor assumed in the 2014 Summer and Winter base cases. The potential need for the Caesar Line upgrade was identified in previous NCTPC studies and was made definite by a confirmed transmission service request on the Duke system.

The purpose of the resource supply option analysis was to evaluate transmission system impacts for various hypothetical/uncommitted resource supply options to meet future native load requirements. For the 2009 Study, the Participants provided input regarding resource supply options to be studied. The PWG developed resource supply option scenarios based on this Participant input. For each resource supply option studied, system impacts were identified that could require new projects or adjustments to existing plans. Tables 4 and 5 list the resource supply option scenarios studied.

Table 4
Resource Supply Options
2019 Hypothetical Transfer Scenarios Studied

Resource From	Sink	Test Level (MW)
NORTH – PJM (AEP)	Duke	600
SOUTH - SOCO	Duke	600
SOUTH – SCEG	Duke	600
SOUTH – SCPSA	Duke	600
EAST – Progress	Duke	600
WEST – TVA	Duke	600
NORTH – PJM (AEP)	Progress (CPLE)	600
NORTH – PJM (DVP)	Progress (CPLE)	600
SOUTH – SCEG	Progress (CPLE)	600
SOUTH – SCPSA	Progress (CPLE)	600
WEST – Duke	Progress (CPLE)	600
NORTH – PJM (AEP/AEP)	Duke / Progress (CPLE)	600 / 600
NORTH – PJM (AEP/DVP)	Duke / Progress (CPLE)	600 / 600
EAST - Progress	PJM (Dominion)	600

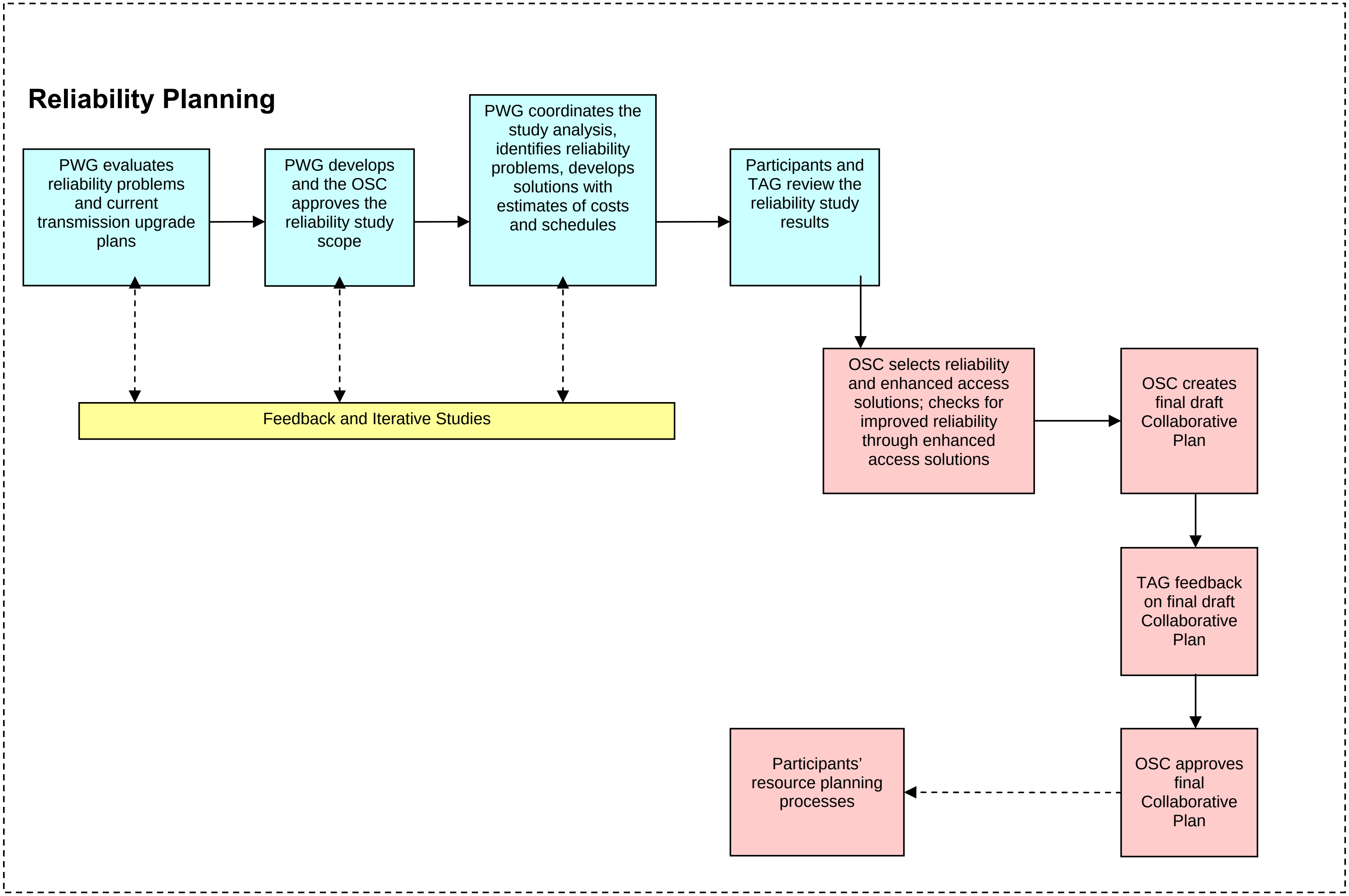
Table 5
Resource Supply Options
2019 Hypothetical Nuclear Generation Scenarios Studied

Company	Location (County)	MWs
Duke	Cherokee, SC	**1160**
Progress	Wake, NC	**1125**

The 2009 NCTPC Process did not include enhanced transmission access studies. At the TAG meeting in January 2009, the OSC presented the TAG with an overview of the ETAP Process, as described in Section II.C, and solicited input from the TAG on scenarios and interfaces to be studied as part of the development of the 2009 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 2009 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 2010 Collaborative Transmission Plan, and input will be solicited from the TAG as part of the 2010 NCTPC Process. Figure 2 illustrates the revised steps for the 2009 NCTPC Process.

Figure 2
2009 NCTPC Process Flow Chart - Revised



III.A. Assumptions

1. Study Year and Planning Horizon

The 2009 Collaborative Transmission Plan addresses a 10 year planning horizon through 2019. The study years chosen for the 2009 Study are listed in Table 6.

Table 6
Study Years

Study Year / Season	Analysis
2014 Summer	Near-term base reliability
2014/2015 Winter	Near-term base reliability
2019 Summer	Long-term base reliability
2019 Summer	Resource supply options

To identify projects required in years other than the base study years of 2014 and 2019, line loading results for those base study years were extrapolated into future years assuming the line loading growth rates in Table 7. 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 7
Line Loading Growth Rates

Company	Line Loading Growth Rate
Duke	1.6 % per year
Progress	1.5 % per year

2. Network Modeling

The network models developed for the 2009 Study included new transmission facilities and upgrades for the 2014 and 2019 summer periods, as appropriate, from the current transmission plans of Duke and Progress and from the 2008 Collaborative Transmission Plan. Table 8 lists the planned major transmission facility projects (with an estimated cost of $10 million or more each) included in the 2014 and 2019 models. Table 9 lists the generation facility additions and retirements included in the 2014 and 2019 models.

Table 8
Major Transmission Facility Projects Included in Models

Company	Transmission Facility	2014 Base	2019 Base & Sensitivities
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	Fort Bragg Woodruff Street-Richmond 230 kV Line	Yes	Yes
Progress	Jacksonville 230 kV SVC	Yes	Yes
Progress	Brunswick-Castle Hayne 230 kV River Crossing	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
Progress	Folkstone 230/115 kV	Yes	Yes
Progress	Durham-RTP 230 kV Line	No	Yes
Progress	Installed Series Reactor at Cape Fear-West End 230 kV West Line	No	Yes
Duke	Reconductored Elon 100 kV Line from Sadler Tie to Glen Raven Main	Yes	Yes
Duke	Reconductored Caesar 230 kV Line from Pisgah Tie to Shiloh Switching Station	Yes	Yes

Table 9
Major Generation Facility Additions and Retirements in Models

Company	Generation Facility	2014	2019
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)	Yes	Yes
Duke	Added[3] Cliffside Unit 6 (825 MW)	Yes	Yes
Duke	Added[3] Dan River CC (620 MW)	Yes	Yes
Duke	Added[3] Buck CC (620 MW)	Yes	Yes
Duke	Added Cleveland Co. CT's (716 MW)	Yes	Yes
Progress	Added[3] 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.

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 and winter base cases and the summer Progress Transmission Reliability Margin ("TRM") cases[4], discussed in Section III.D, are in Appendix A. Appendix A also includes the interchanges associated with the Progress West control area sensitivity analysis.

[3] A Certificate of Public Convenience and Necessity has been granted for Duke Energy's Cliffside Unit 6, Dan River CC, Buck CC, and Progress Energy's Richmond Co. CC.
[4] Since Progress is an importing system, the worst case for studying transfers into Progress is to start with a case that models all firm transfer commitments, including designated network resources and TRM. Progress calls this maximum transfer case its TRM case.

For the 2019 hypothetical transfer scenarios studied, which are listed in Table 4 of Section III, the sink and source control area interchange was modified to accommodate the transfer from the prescribed control area. The generation in the source control areas outside the NCTPC systems was scaled to allow the export; and the Duke or Progress control area, as appropriate, was economically re-dispatched to accommodate the transfer of energy.

III.B. Study Criteria

The results of the base reliability study and the resource supply option 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.

III.C. Case Development

The base case for the base reliability study was developed using the most current 2008 series NERC Multiregional Modeling Working Group (MMWG) model for the systems external to Duke and Progress. The MMWG model of the external systems, in accordance with NERC 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. In the base cases, all confirmed long-term firm transmission reservations with roll-over rights were modeled.

Two sensitivities were studied for 2014. The first adjusted the interchange in the 2014S case for the western portion of the Progress system to evaluate the impact of using available transmission reservations across the Duke system in the summer in addition to their historical winter use. The other sensitivity evaluated the impact of using high temperature conductor to reconductor the Caesar 230 kV line from Pisgah Tie to Shiloh Switching Station instead of using the bundled 954 ACSR conductor assumed in the 2014 Summer and Winter base cases.

The 2019 base cases were the starting point for creating resource supply option cases. Resource supply option cases for the hypothetical transfer scenarios in Table 4 of Section III were modeled as an incremental transfer by adjusting the interchange between the transferring and exporting areas and re-dispatching the generation in those areas in the

2019 base cases developed. For the hypothetical generation scenarios in Table 5 of Section III, the hypothetical generation facility and the generation local to the hypothetical generation facility were modeled at full output and the remainder of the generation was economically re-dispatched within the control area in which the hypothetical generation was located.

III.D. Transmission Reliability Margin

NERC defines Transmission Reliability Margin ("TRM") as:

> *The amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.*

Progress' reliability planning studies model all confirmed transmission obligations for its control area in its base case. Included in this is TRM for use by all LSEs. TRM is composed of contracted VACAR reserve sharing, inrush impacts and parallel path flow impacts. Progress models TRM by scheduling the reserved amount on actual reserved interfaces as posted on the Progress Open Access Same-time Information System ("OASIS").

Duke ensures VACAR reserve sharing requirements can be met through decrementing Total Transfer Capability ("TTC") by the TRM value required on each interface. Sufficient TRM is maintained on all Duke-VACAR interfaces to allow both export and import of the required VACAR reserves. Duke posts the TRM value for each interface on the Duke OASIS.

Both Progress and Duke ensure that TRM is maintained consistent with NERC requirements. The major difference between the methodologies used by the two companies to calculate TRM is that Progress uses a flow-based methodology, while Duke decrements previously calculated TTC values on each interface.

III.E. Technical Analysis and Study Results

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

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.

Generator maintenance cases were developed for the following units:

Allen 4	Allen 5	Bad Creek 1
Belews Creek 1	Buck 5	Catawba 1
Cliffside 5	Cliffside 6	Broad River 1
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

In addition, a generator maintenance case for Lee Nuclear 1 was developed for the resource supply option examining hypothetical generation additions.

Progress created generation down cases which included the use of TRM, as discussed in Section III.D. 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 2014 and 2019 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 system, 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. 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. New or emerging issues identified in the 2009 Study were also discussed with all Participants so that all are aware of potential issues. 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 greater than 80% for resource supply options to allow evaluation of project acceleration.

III.F. Assessment and Problem Identification

The PWG performed an assessment in accordance with the methodology and criteria discussed in Section III of this report, with the analysis work shared by Duke and Progress. The reliability issues identified from the assessments of both the base reliability cases and the resource supply option scenarios were documented and shared within the PWG.

III.G. Solution Development

The 2009 Study performed by the PWG confirmed base reliability problems already identified (i) by Duke and Progress in company-specific planning studies performed individually by the transmission owners and (ii) by the 2008 Study. The PWG participated in the development of potential solution alternatives to the identified base reliability problems and to the issues identified in the resource supply option analysis. The solution alternatives were simulated using the same assumptions and criteria described in Sections III.A through III.E. Duke and Progress developed rough, planning cost estimates and construction schedules for the solution alternatives.

III.H. Selection of Preferred Reliability Solutions

For the base reliability study, the PWG compared solution alternatives and selected the preferred solution, balancing cost, benefit and risk. The PWG selected a preferred set of transmission improvements that provide a reliable and cost effective transmission solution to meet customers' needs while prudently managing the associated risks.

For the resource supply options, the scenarios consisted of hypothetical transfers between Duke and/or Progress as well as from external control areas and hypothetical generators added internal to Duke or Progress. Solution alternatives were identified to address issues found for each scenario studied. The results provide a good measure of the network impacts that each scenario may have on the Duke and Progress transmission systems. Additional analysis would be required to determine the optimal set of projects that would best meet system needs to fully integrate each resource supply option.

III.I. 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 SERC Long-Term Study Group ("LTSG") studies performed for similar time frames. LTSG studies have recently been performed for 2011, 2013, 2015, and 2019 summer time frames. The limiting facilities identified in the PWG study have been previously identified in the LTSG studies for similar scenarios. These limiting facilities have also been identified in the individual transmission owner's internal assessments required by NERC reliability standards.

IV. Base Reliability Study Results

The 2009 Study verified that Duke and Progress have projects already planned to address reliability concerns for the near-term (5 year) and long-term (10 year) planning horizons. There were no unforeseen problems identified in the reliability studies performed on the 2019 base case.

The 2009 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 2009 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 2009 Collaborative Transmission Plan include:

- Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing

- Delayed in-service dates for several previously identified projects, as shown in Table 10 below, due to changes in load forecasts for Progress Energy

Table 10: Progress Delayed Projects

Project	2009 Plan In-Service Date	2008 Plan In-Service Date
Clinton-Lee 230 kV Line	12/1/2011	6/1/2010
Harris Plant – RTP 230 kV Line	6/1/2014	6/1/2011
Greenville-Kinston Dupont 230 kV Line	6/1/2017	6/1/2011
Wake 500 kV Sub, Add 3rd 500/230 kV Transformer	6/1/2018	6/1/2013
Durham-RTP 230 kV Line, Reconductor	6/1/2019	6/1/2014
Cape Fear-West End 230 kV West Line	6/1/2019	6/1/2016
Rockingham-Lilesville 230 kV Line, Add 3rd Line	06/1/2019	6/1/2011

The new projects for Duke in the 2009 Plan include:

- Reconductor Pisgah Tie-Shiloh Switching Station 230 kV lines
- Reconductor Central Tie-Shady Grove Tap 230 kV lines
- Reconductor Peach Valley Tie- Riverview Switching Station 230 kV lines

Sections IV.A through IV.E describe the new or modified projects in the 2009 Collaborative Transmission Plan. Section IV.F describes the High Rock to Tuckertown operating solution and Section IV.G describes the Wateree 100 kV operating solution.

IV.A. Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing

This recently developed project was identified in the base reliability studies performed internally by Progress Energy late in 2008. The need and cost estimates were formally developed after the 2008 NCTPC Collaborative Plan Report. The common tower outage of the two lines from Brunswick Plant that run to Castle Hayne (at river crossing) can cause the thermal rating of the Sutton Plant-Castle Hayne 230 kV Line to be exceeded. The common tower outage, at a river crossing, of the two lines from Brunswick Plant that run to Castle Hayne can cause the thermal rating of the Sutton Plant-Castle Hayne 230 kV Line to be exceeded. This event will also require significant reductions in Brunswick unit outputs for several days to several months, depending upon the damage caused to the lines and towers. Studies show that separating these lines at their common river crossing will eliminate overloading issues for several years, will increase reliability to the Wilmington load area, and will reduce the impact on Brunswick Plant operation.

IV.B. Progress Energy Delayed Projects

Due to changes in load forecasts[5] for both its Eastern and Western service territories, Progress Energy made several changes to in-service dates as shown in Table 10 above. These project delays were reviewed

[5] The changes in load forecasts are a result of the recent economic downturn and enhanced energy efficiency efforts. The rate of load growth in the Carolinas is expected to be lower than in the past. Overall there is still a positive load growth, although by the year 2014, Progress Energy is forecasting a 670 MW reduction in load from its prior forecast in its Eastern Area. The Progress Western Area is predicted to grow at a faster pace than earlier projected which is adding 87 MW to its prior peak forecast. Similarly Duke Energy is forecasting overall slower growth and is forecasting an approximate 1000 MW reduction in its 2014 load from its prior forecast.

internally and determined by Progress Energy after the load forecasts had been established for the 2009 Collaborative study cases. Progress Energy had seven projects that are currently part of the Collaborative Plan that were delayed due to a reduction in the Eastern Area load forecast.

IV.C. Pisgah Tie-Shiloh Switching Station 230 kV Lines

The 2007 NCTPC process identified the potential need to upgrade the Pisgah Tie-Shiloh Switching Station (Caesar) 230 kV lines to support increased import to the Progress West area. A 2008 system impact study for a request for transmission service across Duke into Progress West confirmed the need for additional capacity on the 22 mile, 954 ACSR Caesar Line. Bundling of the existing conductor and installation of new high temperature conductor are viable options for the upgrade. The base case was created with the lines bundled, and a sensitivity study was performed to test the impact of using the high temperature conductor. Both options were identified as being acceptable, with the high temperature conductor option having the lower overall cost. The transmission service request begins 1/1/2010. Upgrade of the line is anticipated to be completed by 6/1/2013. The transmission service request has conditional firm status until the upgrade is completed.

IV.D. Central Tie-Shady Grove Tap 230 kV Lines

In the 2008 Plan, the Central Tie-Shady Grove Tap (Fisher) 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 indicated that the upgrade would not be required until 2020. The increased import to Progress West and the planned bundling of the Pisgah Tie-Shiloh Switching Station (Caesar) 230 kV Line influences the flow on the 230 kV backbone through the south and central region of the Duke system. The 2009 study base case analysis showed that in the 2022 timeframe, loss of one circuit of the Fisher 230 kV double circuit line with Cliffside 5 off-line causes the remaining line to overload. The 2014 summer sensitivity case with high import into Progress West indicates that the line overloads in 2016 due to the increased import – 2017 if the high temperature conductor is used to upgrade the Caesar Line. The project consists of reconductoring 18 miles of the existing 954 ACSR conductor with bundled 954 ACSR conductor. 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. Previous studies' level of Progress West import would result in the upgrade again being required beyond the planning horizon. Duke will continue to monitor the timing of this upgrade.

IV.E. Peach Valley Tie-Riverview Switching Station 230 kV Lines

In the 2007 Plan, the Peach Valley Tie-Riverview Switching Station (London Creek) 230 kV Line reconductoring project was deferred from the 2015 timeframe indicated by the 2006 Collaborative Transmission Plan. The 2007 Study indicated that the upgrade would not be required until 2020. The increased import to Progress West, the planned bundling of the Pisgah Tie- Shiloh Switching Station (Caesar) 230 kV Line, and new generation on the 230 kV backbone through the south and central region of the Duke system affects flow on this line. The 2009 study base case analysis showed that in the 2019 timeframe, loss of one circuit of the London Creek 230 kV double circuit line with the outage of a 230 kV connected Oconee unit outage causes the remaining line to overload. The 2014 summer sensitivity case with high import into Progress West indicates that the line overloads in 2015 due to the increased import. The project to address this consists of reconductoring 20 miles of the existing 795 ACSR conductor with bundled 795 ACSR conductor. The line is sensitive to south to north transfers. Increased import from SOCO lowers loading on the London Creek Lines and can postpone the need for an upgrade. Duke will continue to monitor the timing of this upgrade.

IV.F. High Rock–Tuckertown Operating Solution

Analysis in a variety of other planning studies has indicated the need for an operating guide affecting the High Rock to Tuckertown 100 kV line in the Yadkin control area. Evaluation of the base case condition of the models used in this study indicates that the operating guide would be in effect to satisfy N-1 contingency operating requirements. Therefore, the High Rock-Tuckertown line was modeled as being open in the base case and all subsequent models developed from the base case.

IV.G. Wateree Operating Solution

Previous analysis showed that in the 2012 timeframe, loss of one circuit of the double circuit Wateree 100 kV lines (Wateree-Great Falls) causes the remaining line to overload. This overload would require reconductoring 20 miles of the existing 2/0 Cu conductor. An approved operating guide has been used with increasing frequency to mitigate this problem in the current operating horizon. The operating guide calls for either (1) a decrease in local area generation, if possible, at Wateree (Duke), Great Falls/Dearborn (Duke), or Darlington County/Robinson (Progress) or (2) opening both circuits of the Wateree 100 kV lines. Testing the use of the operating guide has demonstrated that opening the Wateree 100 kV lines remains an effective operating solution with no reliability impacts. With the recent increase in use of the operating guide expected to continue, there is a strong possibility that the system will need to operate in the future with the tie open almost all the time. Therefore, the tie line was modeled as being open in the base models used in this study. Opening the Wateree 100 kV lines removes the Wateree generation's connection to the Duke system. The preferred operating solution is to open the Wateree 115/100 kV transformer tie between Duke and Progress. This operating solution leaves the Wateree generation radially connected to Duke at the end of the Wateree 100 kV lines. The total Wateree generation (83 MW) exceeds Duke's summer one hour rating (71.2 MVA) for one circuit of the Wateree 100 kV lines. The loss of one circuit of the Wateree 100 kV lines would cause the remaining line to overload if the Wateree generation were operating at close to full output. If this contingency were to occur, Duke would be required to quickly reduce Wateree generation to protect the remaining Wateree line. This preferred operating solution is currently being used in the operating horizon.

V. Resource Supply Option Study Results

Resource supply options for 2019 summer consisted of hypothetical transfers between Duke and/or Progress as well as from external control areas and hypothetical generators added internal to Duke and Progress. Solution alternatives were identified to address any issues that required a solution within the 10 year planning horizon. Where issues were found, solution alternatives were discussed, and a primary set of solutions was determined.

V.A. Transfer Resource Supply Options

For the transfer resource supply options listed in Table 3 of Section III, the study results show that the Duke and Progress East transmission systems can each accommodate the scenarios studied without additional projects beyond those in the 2009 Collaborative Transmission Plan, with the exception of a 600MW transfer from South Carolina Electric and Gas (SCEG) to Duke.

The transfer of 600 MW from South Carolina Electric and Gas (SCEG) under conditions where both Catawba Nuclear Station units are off line, results in overload of the Parr (Newport-Parr) 230 kV Line. The Parr Line is a jointly owned tie line between Duke's Newport station and SCEG's VC Summer Nuclear Station. The tie line is loaded to 106% of the applicable rating in the 2019 study. Also, transfer of 600 MW from SCEG with either 230 kV connected Oconee unit out of service results in overload of one circuit of the Clinton (Bush River Tie-Clinton Tie) 100 kV Line on loss of the parallel circuit. The line is loaded to 106% of the applicable rating in the 2019 study. Additional generation is planned for VC Summer in 2015. Therefore, upgrade of both lines is likely to be required prior to 2019.

V.B. Generation Resource Supply Options

A generation resource supply option that incorporated two hypothetical base load nuclear plants was studied. Duke modeled an 1160 MW nuclear plant in Cherokee County, SC, while Progress modeled an 1125 MW plant in Wake County, NC as listed in Table 5 of Section III.

For the generation resource in the Duke control area the study results show that the Duke system can accommodate the scenarios studied with one additional project beyond those in the 2009 Collaborative Transmission Plan.

An additional 1160 MW generator was modeled at the Lee Nuclear Station site in the 2019 model along with the system modifications required to connect the station. The existing Roddey 230 kV Line (Catawba Nuclear Station-Pacolet Tie) was looped into the station. With Cliffside 5 out of service, loss of one of the Roddey West (Lee Nuclear Station-Pacolet Tie) circuits causes the remaining circuit to overload. Bundling of the Roddey West Line would be required in 2019.

For Progress the additional generator (1125 MW) was modeled at the Harris Nuclear Station site in the 2019 model, along with the system modifications required to connect the station. There were no additional transmission upgrades necessary to accommodate this new generation resource in the Progress East control area.

While it is still up to all of the Participants to develop their own resource supply plans, the NCTPC Process offers a valuable way to assess the transmission impacts of the resource supply options for the time period being studied. The primary transmission solution alternatives resulting from this process will help complement integrated resource planning processes and provide valuable transmission system information related to future resource supply needs. The 2009 Study targeted resource supply options in 2019 summer which is near the end of the current 10 year planning horizon. For the hypothetical generation resource supply options, the solutions identified in the 2009 Study may not fully address all of the issues that may occur beyond the planning horizon. Although transmission service for these resources must still be requested and obtained via the OASIS, the 2009 Study results provide the Participants and other stakeholders information regarding potential transmission upgrades that may be required for various resource supply options before the transmission service request is made and the transmission service study results are provided.

VI. Collaborative Transmission Plan

The 2009 Collaborative Transmission Plan includes 18 projects with an estimated cost of $10 million or more each. These projects are listed in Appendix B. . The total estimated cost for these 18 projects included in the 2009 Plan is $595 million. 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 2008 Report and have been deferred beyond the end of the planning horizon based on the 2009 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 18 projects is provided in Appendix C.

Appendix A
Interchange Tables

2014 SUMMER PEAK
DUKE ENERGY CAROLINAS
DETAILED INTERCHANGE

Duke Energy Carolinas Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
CPLE (City of Seneca)	30	30
CPLE (NCEMC)	150	150
CPLE (NCEMC/Anson)	16	16
SCEG (City of Greenwood)	0	0
SCPSA (New Horizons/NHEC)	847	847
SEPA (Hartwell)	155	155
SEPA (Thurmond)	113	113
SOCO (EU2)	63	63
SOCO (NCEMC)	180	180
SOCO (PMPA)	179	179
Total	**1733**	**1733**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE (Broad River)	850	850
CPLE (NCEMC/Catawba)	205	205
CPLE (PEC TRM Reserves)	0	511
CPLE (Rowan)	150	150
CPLE (Fayetteville)	0	0
DVP	100	100
SCEG (Orangeburg)	0	0
Total	**1305**	**1816**

Duke Energy Carolinas Net Interchange - MW

	Base Case	PEC TRM Case
	-428	83

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

2014 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 (Rowan)	150	150
DUKE (Broad River)	850	850
DUKE (NCEMC/Catawba)	205	205
DUKE (Fayetteville)	0	0
DUKE (PEC TRM)	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	**1659**	**3494**

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

	Base Case	PEC TRM Case
DUKE (City of Seneca)	30	30
DUKE (NCEMC)	150	150
DUKE (NCEMC/Anson)	16	16
DVP (Littleton)	9	9
DVP (NCEMPA)	169	169
DVP (PJM-Cravenwood)	47	47
DVP (NCEMC)	113	113
Total	**534**	**534**

Progress Energy Carolinas (East) Net Interchange - MW

	Base Case	PEC TRM Case
	-1125	-2960

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

2014 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
Total	**1**	**1**

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
Total	149	149

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

2014 SUMMER PEAK/WESTERN SENSITIVITY PEAK CASE
DUKE ENERGY CAROLINAS
DETAILED INTERCHANGE

Duke Energy Carolinas Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
CPLE (City of Seneca)	30	30
CPLE (NCEMC)	150	150
CPLE (NCEMC/Anson)	16	16
SCEG (City of Greenwood)	0	0
SCPSA (New Horizons/NHEC)	847	847
SEPA (Hartwell)	155	155
SEPA (Thurmond)	113	113
SOCO (EU2)	63	63
SOCO (NCEMC)	180	180
SOCO (PMPA)	179	179
Total	**1733**	**1733**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE (Broad River)	850	850
CPLE (NCEMC/Catawba)	205	205
CPLE (PEC TRM Reserves)	0	0
CPLW (Rowan)	150	150
CPLE (Fayetteville)	0	0
CPLW (PEC TRM Reserves)	0	206
DVP	100	100
SCEG (Orangeburg)	0	0
Total	**1305**	**1511**

Duke Energy Carolinas Net Interchange - MW

	Base Case	PEC TRM Case
	-428	-222

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

2014 SUMMER PEAK/WESTERN PEAK SENSITIVITY CASE
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	0
CPLW	0	0
DUKE (Rowan)	0	0
DUKE (Broad River)	850	850
DUKE (NCEMC/Catawba)	205	205
DUKE (Fayetteville)	0	0
DUKE (PEC TRM)	0	0
DVP (PEC TRM)	0	0
DVP (SEPA-KERR)	95	95
SCEG (PEC TRM)	0	10
SCPSA (Co-Gen)	9	9
SCPSA (PEC TRM)	0	0
Total	**1359**	**1359**

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

	Base Case	PEC TRM Case
DUKE (City of Seneca)	30	30
DUKE (NCEMC)	150	150
DUKE (NCEMC/Anson)	16	16
CPLW	436	436
DVP (Littleton)	9	9
DVP (NCEMPA)	169	169
DVP (PJM-Cravenwood)	47	47
DVP (NCEMC)	113	113
Total	**970**	**970**

Progress Energy Carolinas (East) Net Interchange - MW

	Base Case	PEC TRM Case
	-389	-389

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

2014 SUMMER PEAK/WESTERN PEAK SENSITIVITY CASE
PROGRESS ENERGY CAROLINAS (WEST)
DETAILED INTERCHANGE

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

	Base Case	PEC TRM Case
TVA (SEPA)	1	1
Duke (Rowan)	150	150
CPLE	436	436
CPLE (PEC TRM Reserves)	0	206
Total	**587**	**793**

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

	Base Case	PEC TRM Case
CPLE	0	0
Total	**0**	**0**

Progress Energy Carolinas (West) Net Interchange - MW

	Base Case	PEC TRM Case
Total	-587	-793

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

2014//2015 WINTER PEAK
DUKE ENERGY CAROLINAS
DETAILED INTERCHANGE

Duke Energy Carolinas Modeled Imports/Purchases - MW

	Base Case	PEC TRM Case
CPLE (City of Seneca)	26	26
CPLE (NCEMC)	150	150
CPLE (NCEMC/Anson)	0	0
SCEG (City of Greenwood)	0	0
SCPSA (New Horizons/NHEC)	816	816
SEPA (Hartwell)	155	155
SEPA (Thurmond)	113	113
SOCO (EU2)	116	116
SOCO (NCEMC)	103	103
SOCO (PMPA)	79	79
Total	**1558**	**1558**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE (Broad River)	850	850
CPLE (NCEMC/Catawba)	205	205
CPLE (PEC TRM Reserves)	0	0
CPLW (Rowan)	150	150
CPLE (Fayetteville)	0	0
CPLW (PEC TRM Reserves)	0	206
DVP (NCEMC)	100	100
SCEG (Orangeburg)	0	0
Total	**1305**	**1511**

Duke Energy Carolinas Net Interchange - MW

	Base Case	PEC TRM Case
	-253	-47

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

2014/2015 WINTER 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	0
DUKE (Rowan)	0	0
DUKE (Broad River)	850	850
DUKE (NCEMC/Catawba)	205	205
DUKE (Fayetteville)	0	0
DUKE (PEC TRM)	0	0
DVP (PEC TRM)	0	0
DVP (SEPA-KERR)	95	95
SCEG (PEC TRM)	0	0
SCPSA (Co-Gen)	9	9
SCPSA (PEC TRM)	0	0
Total	**1359**	**1359**

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

	Base Case	PEC TRM Case
DUKE (City of Seneca)	26	26
DUKE (NCEMC)	150	150
DUKE (NCEMC/Anson)	0	0
CPLW	436	436
DVP (Littleton)	9	9
DVP (NCEMPA)	140	140
DVP (PJM-Cravenwood)	47	47
DVP (NCEMC)	113	113
Total	**921**	**921**

Progress Energy Carolinas (East) Net Interchange - MW

	Base Case	PEC TRM Case
	-438	-438

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

2014/2015 WINTER PEAK
PROGRESS ENERGY CAROLINAS (WEST)
DETAILED INTERCHANGE

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

	Base Case	PEC TRM Case
TVA (SEPA)	1	1
Duke (Rowan)	150	150
CPLE	436	436
CLPE (PEC TRM Reserves)	0	206
Total	**587**	**793**

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

	Base Case	PEC TRM Case
CPLE	0	0
Total	**0**	**0**

Progress Energy Carolinas (West) Net Interchange - MW

	Base Case	PEC TRM Case
Total	-587	-793

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

2019 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)	150	150
CPLE (NCEMC/Anson)	28	28
SCEG (City of Greenwood)	0	0
SCPSA (New Horizons/NHEC)	940	940
SEPA (Hartwell)	155	155
SEPA (Thurmond)	113	113
SOCO (EU2)	0	0
SOCO (NCEMC)	180	180
SOCO (PMPA)	231	231
Total	**1828**	**1828**

Duke Energy Carolinas Modeled Exports/Sales - MW

	Base Case	PEC TRM Case
CPLE (Broad River)	850	850
CPLE (NCEMC/Catawba)	205	205
CPLE (PEC TRM VACAR Reserves)	0	511
CPLE (Rowan)	150	150
DVP	100	100
SCEG (Orangeburg)	0	0
Total	**1305**	**1816**

Duke Energy Carolinas Net Interchange

	Base Case	PEC TRM Case
	-523	-12

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

2019 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 (Broad River)	850	850
DUKE (NCEMC/Catawba)	205	205
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	**1659**	**3494**

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

	Base Case	PEC TRM Case
DUKE (City of Seneca)	31	31
DUKE (NCEMC)	150	150
DUKE (NCEMC/Anson)	28	28
DVP (Littleton)	9	9
DVP (NCEMPA)	169	169
DVP (PJM-Cravenwood)	47	47
DVP (NCEMC)	113	113
Total	**547**	**547**

Progress Energy Carolinas (East) Net Interchange - MW

	Base Case	PEC TRM Case
	-1112	-2947

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

2019 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
Total	**1**	**1**

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
	149	**149**

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

Appendix B
Collaborative Transmission Plan Major Project Listing

2009 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date[4]**	**Estimated Cost ($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	In-Service	Progress	6/1/2009	--	--
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	In-Service	Progress	12/1/2009	--	--
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	1.0 2.5
0010	Rockingham-West End 230kV East Line, Construct Line	Address loading on Rockingham-West End 230 kV Line	Underway	Progress	6/1/2011	32	1.5
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	32	1.5
0021	Ft Bragg Woodruff Street- Richmond 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	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	12/1/2011	26	2.0
0026	Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing	Address loading on Sutton Plant-Castle Hayne 230 kV Line	Underway	Progress	06/1/2012	21	2.5

2009 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date[4]**	**Estimated Cost ($M)[2]**	**Project Lead Time (Years)[3]**
0022	Jacksonville Static VAR Compensator	Address inadequate dynamic voltage recovery after system faults during periods of high imports	Underway	Progress	6/1/2012	34	2.5
0023	Folkstone 230/115kV Substation	Address voltage on Castle Hayne-Jacksonville City 115kV Line	Underway	Progress	6/1/2013	23	3.5
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	6/1/2014	63	4.5
0008	Greenville-Kinston Dupont 230 KV Line , Construct line	Address loading on Greenville-Everetts 230 kV Line	Planned	Progress	6/1/2017	25	4.0
0016	Wake 500 kV Sub, Add 3rd 500/230 kV Transformer Bank	Address loading on existing Wake 500/230 banks	Planned	Progress	6/1/2018	34	4.0
0024	Durham-RTP 230kV Line, Reconductor	Address loading on the Durham-RTP 230kV Line	Planned	Progress	6/1/2019	19	4.0
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	6/1/2019	13	4.0
0018	Rockingham-Lilesville 230 kV Line, Add third line	Address loading on Lilesville-Rockingham 230 kV lines	Underway	Progress	6/1/2019	20	4.0

2009 Collaborative Transmission Plan – Major Project Listing (Estimated Cost > $10M)							
Project ID	**Reliability Project**	**Issue Resolved**	**Status[1]**	**Transmission Owner**	**Projected In-Service Date[4]**	**Estimated Cost ($M)[2]**	**Project Lead Time (Years)[3]**
0025	Reconductor Elon 100 kV Lines (Sadler Tie-Glen Raven Main #1 & #2)	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
0027	Reconductor Caesar 230 kV Lines (Pisgah Tie-Shiloh Switching Station #1 & #2)	Contingency loading of the remaining line on loss of the parallel line during high imports to Progress West.	Planned	Duke	6/1/2013	32	3.0
0014	Reconductor London Creek 230 kV Lines (Peach Valley Tie-Riverview Switching Station #1 & #2)	Contingency loading of the remaining line on loss of the parallel line when a 230 kV connected Oconee unit is off line.	Planned	Duke	6/1/2015	51	3.0
0020	Reconductor Fisher 230 kV Lines (Central Tie-Shady Grove Tap #1 & #2)	Contingency loading of the remaining line on loss of the parallel line when Cliffside 5 is off line.	Planned	Duke	6/1/2017	29	3.0
TOTAL						**595**	

[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.

[4] Progress Energy in-service date changes are associated with changes in area load forecasts.

Appendix C
Collaborative Transmission Plan Major Project Descriptions

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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 up-rated to its full conductor rating between Rockingham and the new tap.

Status	Project is in-service.
Transmission Owner	Progress
Planned In-Service Date	--
Estimated Time to Complete	N/A
Total Project Cost – Actual	$14 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.

C-1

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	Project is in-service.
Transmission Owner	Progress
Planned In-Service Date	--
Estimated Time to Complete	NA
Total Project Cost – Actual	$9 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.

C-2

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 Complete & 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 year for conversion, 2.5 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 as well as maintain Asheville Plant stability.

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.

C-3

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	1.5 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.

C-4

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 almost complete.
Transmission Owner	Progress & Duke
Planned In-Service Date	6/1/2011
Estimated Time to Complete	1.5 years
Estimated Cost	$32 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.

C-5

Project ID and Name: 0021 - Ft. Bragg Woodruff Street- Richmond 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: Design Complete, Right-of-way acquisition almost complete.
Transmission Owner	Progress
Planned In-Service Date	6/1/2011
Estimated Time to Complete	1.5 years
Estimated Cost	$85 M

Narrative Description of the Need for this Project
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.

C-6

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: Design & Right-of-Way Complete
Transmission Owner	Progress
Planned In-Service Date	12/1/2011
Estimated Time to Complete	2 years
Estimated Cost	$26 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.

C-7

Project ID and Name: 0026 - Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing

Project Description
This project consists of constructing a new 230kV line to cross the Cape Fear River.

Status	Underway: Conceptual design options being explored.
Transmission Owner	Progress
Planned In-Service Date	6/1/2012
Estimated Time to Complete	2.5 years
Estimated Cost	$ 23 M

Narrative Description of the Need for this Project
The common tower outage of the two lines from Brunswick Plant that run to Castle Hayne (at river crossing) can cause the thermal rating of the Sutton Plant-Castle Hayne 230 kV Line to be exceeded. This event will also require significant reductions in Brunswick unit outputs for several days to several months, depending upon the damage caused to the lines and towers. Studies show that separating these lines at their common river crossing will eliminate overloading issues for the 10 year planning horizon, will reduce any impact on Brunswick Plant operation, and will increase reliability to the Wilmington load area.

Other Transmission Solutions Considered
Rebuild, reconductor existing line.

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

C-8

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	2.5 years
Estimated Cost	$34 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

C-9

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	3.5 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: 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	6/1/2014
Estimated Time to Complete	4.5
Estimated Cost	$63 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.

C-11

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	6/1/2017
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.

C-12

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	6/1/2018
Estimated Time to Complete	4 years
Estimated Cost	$34 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.

C-13

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	6/1/2019
Estimated Time to Complete	4 years
Estimated Cost	$19 M

Narrative Description of the Need for this Project
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	6/1/2019
Estimated Time to Complete	4 years
Estimated Cost	$13 M

Narrative Description of the Need for this Project
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.

C-15

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	6/1/2019
Estimated Time to Complete	4 years
Estimated Cost	$20 M

Narrative Description of the Need for this Project
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.

C-16

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	2 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.

C-17

Project ID and Name: 0027 – Pisgah Tie - Shiloh Switching Station #1 & #2 230 kV Lines

Project Description
The project consists of reconductoring 22 miles of the existing 954 ACSR conductor with 1158 ACSS conductor.

Status	Planned: Engineering and procurement activities taking place at this time.
Transmission Owner	Duke
Planned In-Service Date	6/1/2013
Estimated Time to Complete	3 years
Estimated Cost	$32 M

Narrative Description of the Need for this Project
The Caesar Lines will achieve 100% of their conductor rating in the 2010 timeframe unless restrictions are made on transmission service to Progress West. The lines are most heavily loaded when there is high import into the Progress West area. For that reason, some transmission service on the Duke-CPLW interface will have conditional firm status until the upgrades are completed.

Other Transmission Solutions Considered
Bundle the line. An additional tie line from Duke to CPLW

Why this Project was Selected as the Preferred Solution
The high temperature conductor option has the lowest overall cost while meeting reliability requirements.

C-18

Project ID and Name: 0014 - Peach Valley Tie - Riverview Switching Station #1 & #2 230 kV Lines

Project Description
The project consists of reconductoring 20 miles of the existing 795 ACSR conductor with bundled 795 ACSR conductor.

Status	Planned: No activities taking place at this time. Recent internal studies indicate an in-service date of 2022. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Transmission Owner	Duke
Planned In-Service Date	2015
Estimated Time to Complete	3 years
Estimated Cost	$51 M

Narrative Description of the Need for this Project
The 2009 study base case analysis showed that in the 2019 timeframe, loss of one circuit of the London Creek 230 kV double circuit line with the outage of a 230 kV connected Oconee unit outage causes the remaining line to overload. The 2014 summer sensitivity case with high import into Progress West indicates that the line overloads in 2015 due to the increased import. The line is sensitive to south to north transfers. Increased import from SOCO lowers loading on the London Creek Lines and can postpone the need for an upgrade.

Other Transmission Solutions Considered
Reactors.

Why this Project was Selected as the Preferred Solution
Duke does not routinely use reactors to redistribute flows on the system. Reactors would increase losses and cause increased flow on the underlying 100 kV system. Bundling of the line will alleviate the loading concern and reduce system losses.

C-19

Project ID and Name: 0020 - Central Tie – Shady Grove Tap #1 & #2 230 kV Lines

Project Description
The project consists of reconductoring 18 miles of the existing 336 and 954 ACSR conductor with bundled 954 ACSR conductor from Central Tie to Shady Grove Tap.

Status	Planned: No activities taking place at this time. Recent internal studies indicate an in-service date of 2016. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Transmission Owner	Duke
Planned In-Service Date	2017
Estimated Time to Complete	3 years
Estimated Cost	$29 M

Narrative Description of the Need for this Project
The 2009 study base case analysis showed that in the 2022 timeframe, loss of one circuit of the Fisher 230 kV double circuit line with Cliffside 5 off-line causes the remaining line to overload. The 2014 summer sensitivity case with high import into Progress West indicates that the line overloads in 2016 due to the increased import – 2017 if the high temperature conductor is used to upgrade the Caesar Line. 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 this upgrade.

Other Transmission Solutions Considered
Reactors.

Why this Project was Selected as the Preferred Solution
Duke does not routinely use reactors to redistribute flows on the system. Reactors would increase losses and cause increased flow on the underlying 100 kV system. Use of the high temperature conductor will alleviate the loading concern and provides the most cost effective solution.

Appendix D
Projects Investigated for Resource Supply Options Studied

Resource Supply Options – 2019 Hypothetical Transfer Scenarios Studied
Imports to Progress East[1,2]

Primary Alternative Investigated	Issue Identified	TO	Lead Time (years)	Duke 600 MW Date Needed	($M)	Duke 1,200 MW Date Needed	($M)	PJM 200 MW Date Needed	($M)	SCPSA 400 MW Date Needed	($M)	SCEG 600 MW Date Needed	($M)
N/A	None.	---	---	---	---	---	---	---	---	---	---	---	---

Resource Supply Options – 2019 Hypothetical Transfer Scenarios Studied
Imports to Duke

Primary Alternative Investigated	Issue Identified	TO	Lead Time (years)	CPLE 600 MW Date Needed	($M)	SOCO 600 MW Date Needed	($M)	PJM 600 MW Date Needed	($M)	TVA 600 MW Date Needed	($M)	SCEG 600 MW Date Needed	($M)	SCPSA 600 MW Date Needed ($M)	
Upgrade Parr-Newport (Parr) 230 kV Line	Line overloads if both Catawba Nuclear Units are out of service.	SCEG/ Duke	3	---	---	---	---	---	---	---	---	2019	**89**	**---**	**---**
Upgrade Bush River Tie-Clinton Tie (Clinton) 100 kV Line	Line overloads if either 230 kV connected Oconee Nuclear Unit is out of service and parallel line opens.	Duke	3	---	---	---	---	---	---	---	---	2019	**40**	**---**	**---**

Resource Supply Options – 2019 Hypothetical Generation Scenarios Studied
In Progress East

Primary Alternative Investigated	Issue Identified	TO	Lead Time (years)	Harris Nuclear 1125 MW Date Needed	($M)								
N/A	None.	---	---	---	---	---	---	---	---	---	---	---	---

Resource Supply Options – 2019 Hypothetical Generation Scenarios Studied
In Duke

Primary Alternative Investigated	Issue Identified	TO	Lead Time (years)	Lee Nuclear Station 1160 MW Date Needed	($M)								
Bundle Lee Nuclear Station-Pacolet Tie (Roddey West) 230 kV Line	Line overloads if either 230 kV connected Oconee Nuclear Units is out of service and parallel line opens.	Duke	3	2019	15	---	---	---	---	---	---	---	---

[1] The tables in Appendix D reflect the date the project is needed in order to implement the resource supply option studied.

[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. Also, the projects required to accommodate each resource supply option were determined independently. Therefore, the projects and cost estimates do not reflect the requirements for simultaneously accommodating two or more resource supply options.

Appendix E
Collaborative Plan Comparisons

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2008 Plan[1]			2009 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
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	12	In-Service	---	--
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	12	In-Service	--	--
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	30	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
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	49	Underway	6/1/2011	32
0021	Ft Bragg Woodruff Street- Richmond 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
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	25	Underway	12/1/2011	26

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2008 Plan[1]			2009 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
0026	Brunswick 1 - Castle Hayne 230kV Line, Construct New Cape Fear River Crossing	Address loading on the Sutton Plant-Castle Hayne 230 kV Line.	--	--	---	---	Underway	06/1/2012	21
0022	Jacksonville Static VAR Compensator	Address inadequate dynamic voltage recovery after system faults during periods of high transfers	Progress	Planned	6/1/2012	30	Planned	6/1/2012	34
0023	Folkstone 230/115kV Substation	Address voltage on Castle Hayne-Jacksonville City 115kV Line	Progress		6/1/2013	21	Planned	6/1/2013	23
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	65	Underway	6/1/2014	63
0008	Greenville-Kinston Dupont 230 KV Line , Construct line	Address loading on Greenville-Everetts 230 kV Line	Progress	Underway	6/1/2011	25	Planned	6/1/2017	25
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	46	Planned	6/1/2018	34

NCTPC Update on Major Projects – (Estimated Cost ≥ $10M)									
				2008 Plan[1]			2009 Plan		
Project ID	Reliability Project	Issue Resolved	Transmission Owner	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]	Status[2]	Projected In-Service Date	Estimated Cost ($M)[3]
0024	Durham-RTP 230kV Line, Reconductor	Address loading on the Durham-RTP 230kV Line	Progress		6/1/2014	22	Planned	6/1/2019	19
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	17	Planned	6/1/2019	13
0018	Rockingham-Lilesville 230 kV Line, Add third line	Address loading on Lilesville-Rockingham 230 kV lines	Progress	Underway	6/1/2011	23	Underway	6/1/2019	20
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		6/1/2011	26	Planned	6/1/2011	26
0027	Reconductor Caesar 230 kV Lines (Pisgah Tie-Shiloh Switching Station #1 & #2)	Contingency loading of the remaining line on loss of the parallel line during high imports to Progress West.	Duke		--	--	Planned	6/1/2013	32
0014	Reconductor London Creek 230 kV Lines (Peach Valley Tie-Riverview Switching Station #1 & #2)	Contingency loading of the remaining line on loss of the parallel line when a 230 kV connected Oconee unit is off line.	Duke	Deferred	--	---	Planned	6/1/2015	51
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	Deferred	--	---	Planned	6/1/2017	29
TOTAL						**520**			**595**

[1] Information reported in Appendix B of the NCTPC 2008 - 2018 Collaborative Transmission Plan" dated December 22, 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 F
Acronyms

ACRONYMS

AEP	American Electric Power
AFUDC	Allowance for Funds Used During Construction
CPLE	Carolina Power & Light East, or Progress East
CPLW	Carolina Power & Light West, or Progress 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 Corporation
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