DUKE ENERGY CAROLINAS
POWER DELIVERY PROJECTS
2007 UPDATE

Project: Antioch 500/230 kV Transformers

Project Description
The project consists of replacing the existing 840 MVA 500/230 kV transformers with 1680 MVA transformers.

Status	Planned: No activities taking place at this time. Recent studies indicate an in-service date of 2013 to 2015. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Planned In-Service Date	2013 - 2015
Estimated Time to Complete	5.0 years
Estimated Cost	$51.9 M for replacement

Narrative Description of the Need for this Project
The Antioch banks will achieve 100% of their present rating (840 MVA) in the 2011-2015 timeframe. Loss of the parallel bank when there is a generation deficiency in Duke's northern region causes the highest loading. North to south transfers into the Duke control area increase bank loading and further decrease import capability. Operating experience indicates a potential earlier need for additional capacity.

Other Transmission Solutions Considered
Perform testing/analysis to eliminate the stray flux heating concern and allow re-rating of the banks closer to their original design. Based on outcome of testing/analysis, replace the banks with higher capacity banks, if necessary.

Why this Project was Selected as the Preferred Solution
The banks have an ~ 7% Outage Transfer Distribution Factor ("OTDF"). For each incremental increase in the rating by 7 MVA, there will be an increase in transfer capability of ~ 100 MW. Evaluation of the stray flux issue may lead to a significant delay in when replacement of the banks may be necessary.

Project: Fisher 230 kV Lines (Central Tie to Shady Grove Tap)

Project Description
The project consists of reconductoring 18 miles of the existing 954 ACSR conductor with bundled 954 ACSR conductor.

Status	Planned: No activities taking place at this time. Recent studies indicate an in-service date of 2016 to 2018. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Planned In-Service Date	2016 - 2018
Estimated Time to Complete	3 years
Estimated Cost	$28.5 M

Narrative Description of the Need for this Project
Flow on the 230 kV backbone through the south and central region of the Duke system continues to increase due to load growth and loop flow impacts from SOCO. Loss of one circuit of this double circuit line causes the remaining line to overload. 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 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. Bundling of the line will alleviate the loading concern and reduce system losses.

Project: Asheboro (PEC) - Pleasant Garden Tie (Duke) 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: Memorandum of understanding is in place.
Planned In-Service Date	6/1/2011
Estimated Time to Complete	3.5 years
Estimated Cost	$40 M

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

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

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

Project: Wateree Tie Area

Project Description
An approved operating guide has been used with increasing frequency to mitigate line loading in the Wateree-Camden-Elgin Tap area 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. 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. No new construction/upgrades will be performed. The tie at Wateree between Duke Energy Carolinas and CP&L East will be left open during normal operating conditions.

Status	Discussion ongoing with appropriate operating and planning personnel for confirmation that solution is acceptable.
Planned In-Service Date	2011
Estimated Time to Complete	1 year
Estimated Cost	$0 M

Narrative Description of the Need for this Project
In the 2012 analysis, 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 in the 2012 and 2016 analyses showed opening the Wateree 100 kV lines remains an effective operating solution with no reliability impacts. Since opening the Wateree 100 kV lines removes the Wateree generation's connection to the Duke system, the preferred operating solution would be to open the Wateree 115/100 kV tie between Duke and Progress. This operating solution would leave the Wateree generation radially connected to Duke at the end of the Wateree 100 kV lines. Since the total Wateree generation (83 MW) exceeds Duke's summer 1 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.

Other Transmission Solutions Considered
Bundling the Wateree-Great Falls 100 kV line.

Why this Project was Selected as the Preferred Solution
Full time implementation of the operating guide is more cost effective than bundling the lines with no adverse affect on the transmission system.

Project: Parkwood 500/230 kV Transformer

Project Description
The project consists of installing relaying that causes the removal from service, via relaying, of the remaining Parkwood 500/230 kV transformer upon loss of the parallel bank when required by initial bank loading.

Status	Planned: No activities taking place at this time. Recent studies indicate an in-service date of 2013 to 2015. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Planned In-Service Date	2013 - 2015
Estimated Time to Complete	1 year
Estimated Cost	$0.1 M

Narrative Description of the Need for this Project
The Parkwood bank 5 will achieve 100% of its present rating (840 MVA) in the 2013-2015 timeframe. Loss of bank 6, under normal and high west to east transfer conditions, causes overload of bank 5. Loss of both bank 5 and 6 mimics the loss of the Pleasant Garden – Parkwood 500 kV line. At this time, loss of the 500 kV line does not have a significant impact on the transmission system. Therefore, removing both banks from service for the loss of the parallel bank is a viable solution alternative. The timing of this project can be accelerated by west to east transfers to CPLE.

Other Transmission Solutions Considered
Replacement with a higher rated bank.

Why this Project was Selected as the Preferred Solution
The cost for adding the relaying is significantly less than the cost of new transformer capacity.

Project: London Creek 230 kV Lines (Peach Valley Tie – Riverview Switching Station)

Project Description
The project consists of reconductoring 19 miles of the existing 795 ACSR conductor with bundled 795 ACSR conductor.

Status	Planned: No activities taking place at this time. Recent studies indicate an in-service date of 2016 to 2020. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Planned In-Service Date	2016 - 2020
Estimated Time to Complete	3 years
Estimated Cost	$22.0 M

Narrative Description of the Need for this Project
Flow on the 230 kV backbone through the south and central region of the Duke system continues to increase due to load growth and loop flow impacts from SOCO. Loss of one circuit of this double circuit line causes the remaining line to overload. The line is sensitive to south to north transfers. Increased import from SOCO decreases loading on the London Creek lines and can delay the need for 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. Bundling of the line will alleviate the loading concern and reduce system losses.

Project: Pleasant Garden 500/230 kV Transformer

Project Description
The project consists of adding a second 1680 MVA 500/230 kV transformer.

Status	Planned: No activities taking place at this time. Recent studies indicate an in-service date of 2016 to 2025. Timing of the need for the upgrade will continue to be monitored and action taken considering appropriate lead time required.
Planned In-Service Date	2016 - 2025
Estimated Time to Complete	3.0 years
Estimated Cost	$20 M

Narrative Description of the Need for this Project
The existing Pleasant Garden bank loads up significantly on the loss of the Pleasant Garden – Parkwood Tie 500 kV line when there is a generation deficiency in Duke's northern region. West to east transfers into the CPLE control area increase bank loading and further decrease import capability.

Other Transmission Solutions Considered
Adding additional 500/230 kV tie stations elsewhere in the system to relieve loading on the Pleasant Garden bank.

Why this Project was Selected as the Preferred Solution
A parallel bank at Pleasant Garden has the most direct impact on existing bank and the station is already configured for the additional bank.

Project: Caesar 230 kV Lines (Pisgah Tie – Shiloh Tie)

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

Status	Under study
Planned In-Service Date	To be determined
Estimated Time to Complete	3 years
Estimated Cost	$46.0 M

Narrative Description of the Need for this Project
Flow on the 230 kV corridor through the south and central region of the Duke system into CPLW is directly impacted by load growth in CPLW and the choice of resources to meet load in the CPLW region. Line loading continues to increase due to CPLW load growth and anticipated changes in resources are likely to have a significant impact. Loss of one circuit of this double circuit line causes the remaining line to overload. Duke plans to perform joint analysis with Progress Energy to more clearly define 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. Bundling of the line will alleviate the loading concern and reduce system losses.

Project: Norman 230 kV Lines (McGuire Nuclear Station – Riverbend Steam Station)

Project Description
The project consists of installing reactors on the 8 mile, 1272 ACSR conductor line.

Status	Under study
Planned In-Service Date	To be determined
Estimated Time to Complete	2 years
Estimated Cost	$4.0 M

Narrative Description of the Need for this Project
Flow on the 230 kV corridor to the south from McGuire Nuclear Station is significantly impacted by dispatch conditions, particularly during off peak/pumping hours. During these conditions, loss of one circuit of this double circuit line causes the remaining line to overload. The lines frequently alarm in the Real Time Contingency Analysis indicating a need to evaluate the cause and potential corrective action. Duke plans to perform analysis to more clearly define the cause and the timing of any needed upgrade.

Other Transmission Solutions Considered
Available solutions are limited by high fault duty conditions on the McGuire 230 kV, such that solutions which would reduce system impedance are not acceptable.

Why this Project was Selected as the Preferred Solution
Bundling of the line is not a viable alternative.

Project: Buck Combined Cycle Generation

Project Description
620 MW of combined cycle generation added at the existing Buck 230 kV station in Rowan County, NC. Some retirement of generation at the location is expected.

Status	Under study
Planned In-Service Date	2010 – 2011
Estimated Time to Complete	3 years
Estimated Cost of Upgrades	$0.4 M

Narrative Description of the Need for this Project
Duke Energy's resource plan includes the need for new generation at this site. Only upgrade of overdutied breakers is required.

Other Transmission Solutions Considered
None

Why this Project was Selected as the Preferred Solution
Not applicable

Project: Dan River Combined Cycle Generation

Project Description
620 MW of combined cycle generation added at the existing Dan River 100 kV station in Rockingham County, NC. Some retirement of generation at the location is expected.

Status	Under study
Planned In-Service Date	2011 – 2012
Estimated Time to Complete	3 years
Estimated Cost of Upgrades	$24 M

Narrative Description of the Need for this Project
Duke Energy's resource plan includes the need for new generation at this site. Upgrades are required in the local area on the 100 kV system.

Other Transmission Solutions Considered
None

Why this Project was Selected as the Preferred Solution
Generation interconnection study results indicate the selected upgrades are the most cost effective solution for the reliability issues caused by the additional generation.

Project: Cliffside Coal Fired Generation

Project Description
880 MW of coal fired generation added at a new station on the 500 kV South Mountain Line (McGuire Nuclear – Jocassee Tie) in Rutherford/Cleveland County, NC - located at the site of the existing Cliffside generation. Some retirement of generation at the location is expected.

Status	Under study
Planned In-Service Date	2012
Estimated Time to Complete	0 years
Estimated Cost of Upgrades	$0 M

Narrative Description of the Need for this Project
Duke Energy's resource plan includes the need for new generation at this site.

Other Transmission Solutions Considered
None

Why this Project was Selected as the Preferred Solution
Not applicable

Project: WS Lee Nuclear Generation

Project Description
2200 MW of nuclear generation added at a new 500/230 kV station located near Cherokee, SC. The 500 kV Asbury Line (Newport Tie – Oconee Nuclear) will be folded in to the site. The 230 kV Roddey Line (Catawba Nuclear – Pacolet Tie) will also be folded in to the site.

Status	Under study
Planned In-Service Date	2018
Estimated Time to Complete	5 years
Estimated Cost of Upgrades	$200 M

Narrative Description of the Need for this Project
Duke Energy's resource plan includes the need for new generation at this site.

Other Transmission Solutions Considered
Various configurations were considered for this site.

Why this Project was Selected as the Preferred Solution
The design chosen provides the greatest reliability and cost benefits.