Southeastern Regional TRANSMISSION PLANNING

2014

Southeastern Regional Transmission Planning (SERTP)

December 2014

Regional Transmission Planning Analyses

I. Overview of Regional Analyses

SERTP sponsors plan and expand the transmission system to reliably and economically satisfy the load projections, resource assumptions, public policy requirements, and transmission service commitments within the region. This transmission planning is a very iterative process, with delivery needs and associated transmission projects constantly evolving. From the start, transmission planning in the SERTP region reflects a high degree of coordination and joint modeling between neighboring systems. If reliability constraints are identified, the SERTP sponsors work to identify cost-effective, reliable transmission projects, not only on their respective transmission systems, but also considering potential transmission projects across two or more transmission systems. Transmission plans are discussed with SERTP stakeholders at regular intervals during the year and the frequent engagement with stakeholders allows for additional inputs into potential project alternatives. Each cycle, such planning culminates in the development of a regional transmission plan that contains transmission projects to address the transmission needs within the SERTP region. This regional transmission plan is a "snapshot" – constantly changing and solely intended to reflect the then-current transmission plan based upon then-current forecasted assumptions and transmission delivery service needs.

As part of the regional planning process, SERTP sponsors annually conduct regional transmission planning analyses and assess if the then-current regional transmission plan addresses the transmission needs within the SERTP region. These regional analyses include an assessment of whether there may be more efficient or cost effective transmission projects to address transmission needs than those projects included in the then-current regional transmission plan.

More information on the 2014 regional transmission plan and associated input assumptions into its development can be found within the 2014 Regional Transmission Plan & Input Assumption Overview document on the SERTP website.

Regional Transmission Planning Models

The SERTP annually develops regional powerflow models, which include the coordinated inputs and assumptions needed to support on-going regional transmission planning analyses. These powerflow models, which are available to SERTP stakeholders via the secure area of the SERTP website, are listed in Table I.1 below. The SERTP regional powerflow models provide modeling representations of the existing transmission topology plus forecasted topology changes throughout the ten year planning horizon. In addition, these models incorporate the input assumptions, including load forecasts, generating resources, and interface commitments, as provided by Load Serving Entities ("LSEs") and other transmission customers for use in planning the transmission system.

Table I.1: 2014 Series SERTP Regional Powerflow Models

No.	Season	Year	MMWG Starting Point Case
1	Summer	2015	2015S
2		2017	2015S
3		2019	2019S
4		2020	2019S
5		2022	2019S
6		2024	2024S
7	Shoulder	2019	2019S
8		2022	2019S
9		2024	2024S
10	Winter	2019	2019-20W
11		2024	2019-20W
12	Light Load	2015	2014LL

II. Assessment of the 2014 Regional Plan

Regional transmission analyses were performed throughout the 2014 transmission planning cycle to assess the current regional transmission plan. This coordinated analysis was performed using the twelve (12) SERTP regional powerflow models listed above in Table I.1.

For the regional transmission analyses, power flow studies are initially performed based upon the assumption that thermal limits will yield the most limiting constraints. Voltage, stability, and short circuit studies are performed if circumstances warrant. Siemens PSS/E software was utilized to perform the powerflow analyses on the regional models. A more detailed description on the study criteria utilized is provided below:

Monitored Facilities

Facilities in the SERTP region that operate at 100 kV and above were monitored in the regional transmission planning analyses. Screening for potential constraints was based upon the thermal and voltage rating criteria applicable to each transmission facility.

Contingency Selection

Contingency (N-1) analysis was performed for all transmission facilities in the SERTP region that operate at 100 kV and above. Additional contingencies of transmission facilities external to the SERTP region were evaluated as appropriate.

Regional Transmission Analysis Results

The results of the regional transmission analysis for each Balancing Authority Area ("BAA") in the SERTP region are provided in Tables II.1 – II.9 below. These results include potentially constrained transmission facilities, if any, that were identified as a result of the assessment of the 2014 regional transmission plan.

AECI

Table II.1: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Carolinas

Table II.2: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Progress East

Table II.3: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Progress West

Table II.4: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

LG&E/KU

Table II.5: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

OVEC

Table II.6: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

PowerSouth

Table II.7: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

Southern

Table II.8: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

TVA

Table II.9: Potential Thermal and Voltage Constraints Identified in SERTP Regional Models

Facility	Constraint Type	Year	Season
None Identified	-	-	-

2014 Regional Transmission Plan Assessment

As depicted in Tables II.1 through II.9, no potentially constrained transmission facilities were identified in the regional assessment of the 2014 regional transmission plan. In other words, the regional transmission analysis, performed on the coordinated regional models that reflect the latest load, generation, and transmission assumptions of each of the SERTP Sponsors, affirms that the transmission projects contained within the 2014 regional transmission plan are effective in addressing the transmission needs within the SERTP region.

III. Regional Analysis of Potential Transmission Project Alternatives

The regional transmission analyses performed by the SERTP sponsors also includes an assessment to look for and evaluate potentially more efficient or cost effective alternative transmission projects as compared to those transmission projects included in the 2014 regional transmission plan.

In 2014, the SERTP sponsors identified a list of eight (8), new potential transmission project alternatives for this regional analysis and evaluated those projects using the SERTP regional powerflow models.

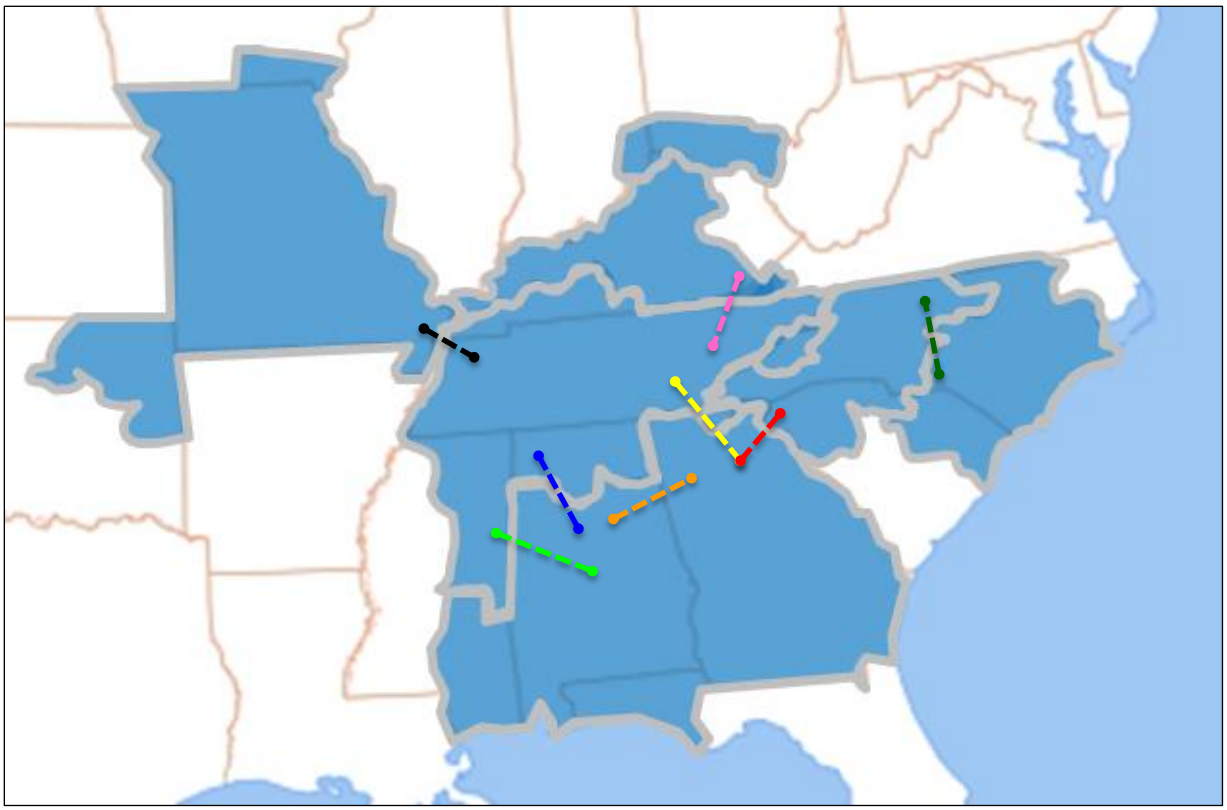
Potential Alternative Transmission Projects

Table III.1 below lists the eight (8), new transmission project alternatives that were identified for regional planning analysis and evaluated through coordination among the SERTP sponsors. These transmission project alternatives were generally identified by reviewing the 2014 regional transmission plan and identifying areas with multiple forecasted transmission projects, in which such projects could potentially be displaced by a project of the size and scope of a regional transmission project. The general location of these alternative transmission projects is shown in Figure III.1 below.

Table III.1: Alternative Transmission Projects Evaluated for Regional Planning Analysis

Alternative Transmission Project	Voltage	Miles	From *BAA (State)*	To *BAA (State)*
Central Alabama – West Point T.L.	500 kV	110	SBA (AL)	TVA (MS)
Clay – Bowen T.L.	500 kV	130	SBA (AL)	SBA (GA)
Miller – (West Point/Browns Ferry) Tap T.L.	500 kV	100	SBA (AL)	TVA (AL)
South Hall – Oconee T.L. (2nd Circuit)	500 kV	70	SBA (GA)	DEC (SC)
South Hall – Watts Bar T.L.	500 kV	100	SBA (GA)	TVA (TN)
Roane – Pineville T.L.	500 kV	65	TVA (TN)	LG&E/KU (KY)
Weakley – West New Madrid T.L.	500 kV	55	TVA (TN)	AECI (MO)
Pleasant Garden – Richmond T.L.	500 kV	90	DEC (NC)	DEP (NC)

Figure III.1: Transmission Project Alternatives Evaluated for Regional Planning Analysis



- Central Alabama – West Point 500 kV T.L.
- Clay – Bowen 500 kV T.L.
- Miller – (West Point – Browns Ferry) Tap 500 kV T.L.
- South Hall – Oconee 500 kV T.L. (2nd Circuit)
- South Hall – Watts Bar 500 kV T.L.
- Roanne – Pineville 500 kV T.L.
- Weakley – West New Madrid 500 kV T.L.
- Pleasant Garden – Richmond 500 kV T.L.

Regional Analysis of the Alternative Transmission Projects

In order to evaluate if the eight (8) transmission project alternatives were potentially more efficient or cost effective alternative transmission projects in addressing regional transmission needs as compared to those transmission projects included in the 2014 regional transmission plan, the SERTP sponsors performed coordinated analysis using the corresponding regional models in the 2019, 2022, and 2024 timeframes[1]. Specifically, each SERTP sponsor utilized its respective transmission planning criteria to evaluate if the alternative transmission project (i) addressed transmission needs already addressed by other transmission projects contained in the 2014 regional transmission plan and/or (ii) resulted in additional transmission constraints within the SERTP region. A more detailed description of the monitored facilities and contingency selection is provided below:

Monitored Facilities

Facilities in the SERTP region that operate at 100 kV and above were monitored in the regional transmission planning analyses. Screening for potential constraints was based upon the thermal and voltage rating criteria applicable to each transmission facility.

Contingency Selection

Contingency analysis was performed for transmission facilities in the SERTP based upon the respective transmission planning criteria for each SERTP Sponsor.

[1] The information contained within this document does not represent a commitment to proceed with the potential alternative transmission projects nor implies that these projects could be implemented by the study dates.

III.A Central Alabama – West Point 500 kV Transmission Line

Project Description

This transmission project alternative was evaluated as a 110 mile, 500 kV transmission line with one termination point at the Central Alabama 500 kV substation in Alabama within the Southern BAA and the other termination point at the West Point 500 kV substation in Mississippi within the TVA BAA.

Analysis Results

The tables below list any significant transmission projects included within the 2014 regional transmission plan that could be potentially displaced by this transmission project alternative as well as any additional thermal or voltage constraints that may be driven as a result of implementing the project. Results are organized by each BAA in the SERTP region. For any additional thermal or voltage constraints identified driven by the alternative transmission project, the tables below list the earliest year in which the constraint was identified. Any such constraints were identified in all subsequent years of analysis unless otherwise noted.

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- TVA

Southern

Table III.A.1: Thermal and Voltage Constraints Driven by the Alternative Transmission Project

Facility	Constraint Type	Year
384557 3GREENVL3 115 384561 3ECIGREEN 115 1	Thermal	2019[2]

Analysis Summary

The planning level estimate for the Central Alabama – West Point 500 kV transmission line is approximately **$346,000,000**. There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

[2] This constraint was only identified for the 2019 analysis year.

III.B Clay – Bowen 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 130 mile, 500 kV transmission line with one termination point at the Clay 500 kV substation in Alabama within the Southern BAA and the other termination point at the Bowen 500 kV substation in Georgia within the Southern BAA.

Analysis Results

The tables below list any significant transmission projects included within the 2014 regional transmission plan that could be potentially displaced by this transmission project alternative as well as any additional thermal or voltage constraints that may be driven as a result of implementing the project. Results are organized by each BAA in the SERTP region. For any additional thermal or voltage constraints identified driven by the alternative transmission project, the tables below list the earliest year in which the constraint was identified. Any such constraints were identified in all subsequent years of analysis unless otherwise noted.

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- TVA

Southern

Table III.B.1: Significant Transmission Projects Displaced by the Alternative Transmission Project

Displaced Project	Planning Estimate	Project Year[3]
Miller – Boyles 230 kV T.L.	$ 3,600,000	2022

Analysis Summary

The planning level estimate for the Clay – Bowen 500 kV transmission line is approximately **$435,000,000.** The total cost of all the potentially displaced transmission projects within the SERTP region is approximately **$3,600,000** and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

[3] These results assume that the transmission project alternative could be implemented by the project in-service dates shown.

III.C Miller – (West Point/Browns Ferry) Tap 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 100 mile, 500 kV transmission line with one termination point at the Miller 500 kV substation in Alabama within the Southern BAA and the other termination point at a new substation along the West Point – Browns Ferry 500 kV transmission line in Alabama within the TVA BAA.

Analysis Results

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- Southern
- TVA

Analysis Summary

The planning level estimate for the Miller – (West Point/Browns Ferry) Tap 500 kV transmission line is approximately **$324,000,000**. There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

III.D South Hall – Oconee 500 kV Transmission Line (2nd Circuit)

Project Description

This alternative transmission project was evaluated as a 70 mile, 500 kV transmission line with one termination point at the South Hall 500 kV substation in Georgia within the Southern BAA and the other termination point at the Oconee 500 kV substation in South Carolina within the Duke Energy Carolinas BAA. This project would parallel the existing South Hall – Oconee 500 kV transmission line.

Analysis Results

The tables below list any significant transmission projects included within the 2014 regional transmission plan that could be potentially displaced by this transmission project alternative as well as any additional thermal or voltage constraints that may be driven as a result of implementing the project. Results are organized by each BAA in the SERTP region. For any additional thermal or voltage constraints identified driven by the alternative transmission project, the tables below list the earliest year in which the constraint was identified. Any such constraints were identified in all subsequent years of analysis unless otherwise noted.

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- TVA

Duke Energy Carolinas

Table III.D.1: Thermal and Voltage Constraints Driven by the Alternative Transmission Project

Facility	Constraint Type	Year
306008 8OCONEE 500 1 306007 6OCONEE 230 1	Thermal	2022

Southern

Table III.D.2: Significant Transmission Projects Displaced by the Alternative Transmission Project

Displaced Project	Planning Estimate	Project Year[4]
Russell – Athena – Bethabara 230 kV T.L.s	$95,000,000	2024

Table III.D.3: Thermal and Voltage Constraints Driven by the Alternative Transmission Project

Facility	Constraint Type	Year
2766 S HALL B1 230 3067 CANDLER 230 1	Thermal	2019
3067 CANDLER 230 3073 BRASELTON 230 1	Thermal	2019
389 MCEVER RD 115 1324 COLLEGE SQ 115 1	Thermal	2022
3 NORCROSS 500 2620 NORCROS LS2 230 1	Thermal	2024
56 BERKELEY LK 230 2623 NORCROSS B3 230 1	Thermal	2024

Analysis Summary

The planning level estimate for the second South Hall – Oconee 500 kV transmission line is approximately **$295,000,000.** The total cost of all the potentially displaced transmission projects within the SERTP region is approximately **$95,000,000** and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

[4] These results assume that the transmission project alternative could be implemented by the project in-service dates shown.

III.E South Hall – Watts Bar 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 100 mile, 500 kV transmission line with one termination point at the South Hall 500 kV substation in Georgia within the Southern BAA and the other termination point at the Watts Bar 500 kV substation in Tennessee within the TVA BAA.

Analysis Results

The tables below list any significant transmission projects included within the 2014 regional transmission plan that could be potentially displaced by this transmission project alternative as well as any additional thermal or voltage constraints that may be driven as a result of implementing the project. Results are organized by each BAA in the SERTP region. For any additional thermal or voltage constraints identified driven by the alternative transmission project, the tables below list the earliest year in which the constraint was identified. Any such constraints were identified in all subsequent years of analysis unless otherwise noted.

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- TVA

Southern

Table III.E.1: Significant Transmission Projects Displaced by the Alternative Transmission Project

Displaced Project	Planning Estimate	Project Year[5]
Russell – Athena – Bethabara 230 kV T.L.s	$95,000,000	2024

Table III.E.2: Thermal and Voltage Constraints Driven by the Alternative Transmission Project

Facility	Constraint Type	Year
2766 S HALL B1 230 3067 CANDLER 230 1	Thermal	2019
3067 CANDLER 230 3073 BRASELTON 230 1	Thermal	2019
95 WINDER P B1 230 3073 BRASELTON 230 1	Thermal	2019
11 S HALL 500 2035 S HALL LS 230 1	Thermal	2019
95 WINDER P B1 230 2076 OLDFREEMILL 230 1	Thermal	2022
3 NORCROSS 500 2620 NORCROS LS2 230 1	Thermal	2022
389 MCEVER RD 115 1324 COLLEGE SQ 115 1	Thermal	2022

Analysis Summary

The planning level estimate for the South Hall – Watts Bar 500 kV transmission line is approximately **$265,000,000.** The total cost of all the potentially displaced transmission projects within the SERTP region is approximately **$95,000,000** and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

[5] These results assume that the transmission project alternative could be implemented by the project in-service dates shown.

III.F Roane – Pineville 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 65 mile, 500 kV transmission line with one termination point at the Roanne 500 kV substation in Tennessee within the TVA BAA and the other termination point at the Pineville 500 kV substation in Kentucky within the LG&E/KU BAA.

Analysis Results

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- Southern
- TVA

Analysis Summary

The planning level estimate for the Roanne – Pineville 500 kV transmission line is approximately **$165,000,000**. There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

III.G Weakley – West New Madrid 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 55 mile, 500 kV transmission line with one termination point at the Weakley 500 kV substation in Tennessee within the TVA BAA and the other termination point at the West New Madrid 500 kV substation in Missouri within the AECI BAA.

Analysis Results

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- Southern
- TVA

Analysis Summary

The planning level estimate for the Weakley – West New Madrid 500 kV transmission line is approximately **$138,000,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

III.H Pleasant Garden – Richmond 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 90 mile, 500 kV transmission line with one termination point at the Pleasant Garden 500 kV substation in North Carolina within the Duke Carolinas BAA and the other termination point at the Richmond 500 kV substation in North Carolina within the Duke Progress East BAA.

Analysis Results

The evaluation of the alternative transmission project did not identify any potentially displaced transmission projects or additional thermal or voltage constraints driven by implementing the project for the following BAAs:

- AECI
- Duke Carolinas
- Duke Progress East
- Duke Progress West
- LG&E/KU
- OVEC
- PowerSouth
- Southern
- TVA

Analysis Summary

The planning level estimate for the Pleasant Garden – Richmond 500 kV transmission line is approximately **$270,000,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this particular transmission project alternative is not currently a more efficient or cost effective project to address transmission needs in the SERTP region. A calculation of real power transmission loss impacts was not performed as it would be unlikely to measurably change the results of the 2014 regional assessment.

IV. Regional Analysis Conclusions

In the 2014 planning cycle, the SERTP Sponsors performed regional transmission planning analyses to assess the 2014 regional transmission plan, including an assessment of whether there may be more efficient or cost effective transmission project alternatives to address transmission needs in the SERTP region. The results of such analyses affirm that the current regional transmission plan contains transmission projects that reliably and cost-effectively address all current and forecasted transmission needs within the SERTP region for the 2014 planning cycle.

The assessment of the 2014 regional transmission plan identified no potentially constrained transmission facilities and demonstrated that the regional plan addresses transmission needs in the SERTP region. Furthermore, none of the eight (8), new potential transmission project alternatives evaluated was found to be more efficient or cost effective as compared to the transmission projects included in the 2014 regional transmission plan.

The SERTP sponsors plan and expand the transmission system to reliably and economically satisfy the load projections, resource assumptions, public policy requirements, and transmission service commitments within the region. From the start, this transmission planning, and the corresponding transmission projects contained within the regional transmission plan, reflects a high degree of coordination and joint modeling between neighboring systems. This planning approach results in reliable and cost effective transmission projects and, on a cumulative basis, a reliable and cost effective regional transmission plan. While none of the eight (8) potential transmission project alternatives were more efficient or cost effective in meeting the transmission needs for the 2014 planning cycle, transmission planning is a very iterative process, with delivery needs and associated transmission projects constantly evolving. The 2014 regional transmission plan represents a "snapshot" – solely intended to reflect the then-current transmission plan based upon then-current forecasted assumptions and transmission delivery service needs. Therefore, in the 2015 planning cycle, the SERTP sponsors will continue to assess current as well as newly-identified potential project alternatives, including if any or all of these eight (8) new potential transmission projects warrant continued consideration based upon any changes in forecasted assumptions.