SERTP Southeastern Regional Transmission Planning

Regional Transmission Planning Analyses

December 2, 2019

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 2019 regional transmission plan and associated input assumptions into its development can be found within the 2019 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: 2019 Series SERTP Regional Powerflow Models

No.	Season	Year	MMWG Starting Point Case
1	Summer	2020	2020SUM
2		2022	2020SUM
3		2024	2023SUM
4		2025	2023SUM
5		2027	2023SUM
6		2029	2028SUM
7	Shoulder	2022	2020SUM
8		2024	2023SH
9		2027	2023SH
10		2029	2028SUM
11	Winter	2024	2023WIN
12		2029	2028WIN

II. Assessment of the 2019 Regional Plan

Regional transmission analyses were performed throughout the 2019 transmission planning cycle to assess the current regional transmission plan. This coordinated analysis was performed using the 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 and PowerGEM TARA software were 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 2019 regional transmission plan.

Associated Electric Cooperative (AECI)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Carolinas (DEC)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Progress East (DEPE)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

DUKE Energy Progress West (DEPW)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

Gulf Power (GULF)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

Louisville Gas & Electric and Kentucky Utilities (LG&E/KU)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

PowerSouth (PS)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

Southern (SBAA)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

Tennessee Valley Authority (TVA)

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

Facility	Constraint Type	Year	Season
None Identified	-	-	-

2019 Regional Transmission Plan Assessment

As shown in Tables II.1 through II.9, no potentially constrained transmission facilities were identified in the assessment of the 2019 regional transmission plan. Therefore, 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 2019 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 2019 regional transmission plan.

In 2019, the SERTP sponsors identified a list of five (5), new potential transmission project alternatives for this regional analysis and evaluated those projects using the SERTP regional powerflow models.

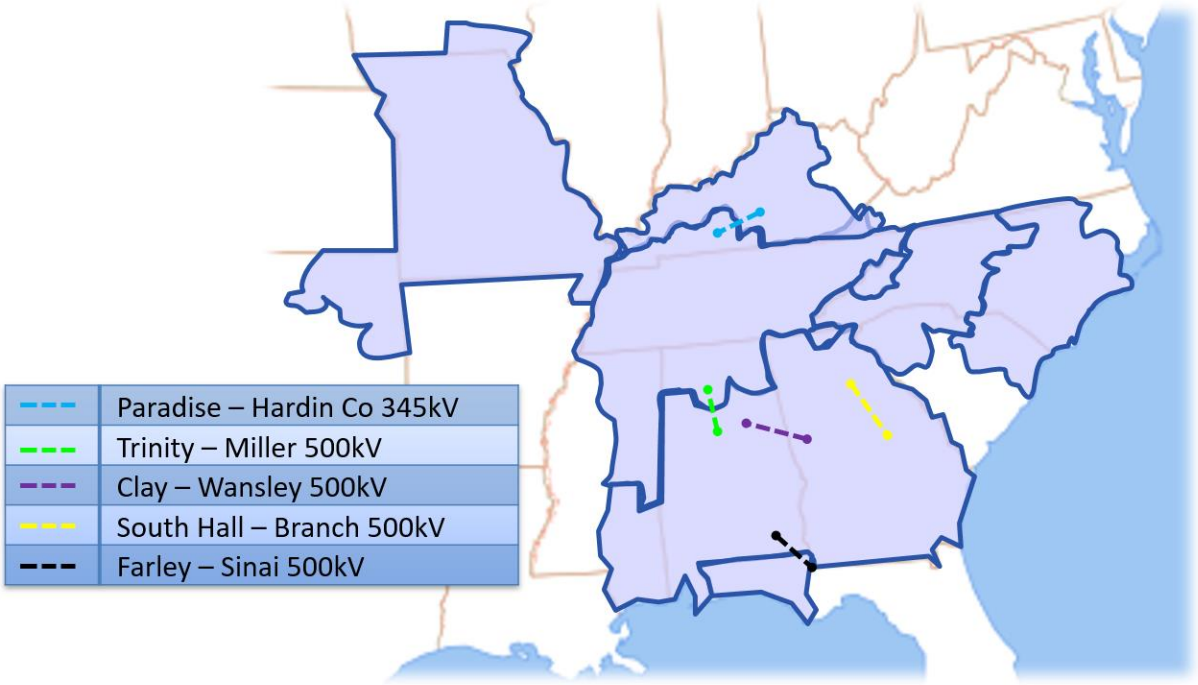
Potential Alternative Transmission Projects

Table III.1 below lists the five (5), 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 chosen by 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	Miles	From *BAA (State)*	To *BAA (State)*
Paradise – Hardin Co 345 kV	67	TVA (KY)	LG&E/KU (KY)
Trinity – Miller 500 kV	68	TVA (AL)	SBAA (AL)
Clay – Wansley 500 kV	100	SBAA (AL)	SBAA (GA)
South Hall – Branch 500 kV	80	SBAA (GA)	SBAA (GA)
Farley – Sinai 500 kV	50	SBAA (AL)	Gulf (FL)

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



Regional Analysis of the Alternative Transmission Projects

In order to evaluate if the five (5) 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 2019 regional transmission plan, the SERTP sponsors performed coordinated analysis using the corresponding regional models in the 2024 and 2029 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 2019 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 Paradise – Hardin Co 345 kV Transmission Line

Project Description

This transmission project alternative was evaluated as a 67-mile, 345 kV transmission line with one termination point at the Paradise 345 kV substation in Tennessee within the TVA Balancing Authority Area and the other termination point at the Hardin Co 345 kV substation in Kentucky within the LG&E/KU Balancing Authority Area.

Analysis Results

The tables below list any significant transmission projects included within the 2019 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 balancing area in the SERTP region. For any additional thermal or voltage constraints identified as 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 Balancing Authority Areas:

- AECI
- DEC
- DEPE
- DEPW
- GULF
- LG&E/KU
- PS
- SBAA
- TVA

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

Displaced Project	Planning Estimate	Project Year
None Identified	-	-

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

Facility	Constraint Type	Year
None Identified	-	-

Analysis Summary

The planning level estimate for the Paradise – Hardin Co 345 kV transmission line is approximately **$171,500,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this 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 2019 regional assessment.

III.B Trinity - Miller 500 kV Transmission Line

Project Description

This transmission project alternative was evaluated as a 68-mile, 500 kV transmission line with one termination point at the Trinity 500 kV substation in Tennessee within the TVA Balancing Authority Area and the other termination point at the Miller 500 kV substation in Alabama within the Southern Balancing Authority Area.

Analysis Results

The tables below list any significant transmission projects included within the 2019 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 Balancing Authority Area 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 Balancing Authority Areas:

- AECI
- DEC
- DEPE
- DEPW
- GULF
- LG&E/KU
- PS
- SBAA
- TVA

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

Displaced Project	Planning Estimate	Project Year
None Identified	-	-

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

Facility	Constraint Type	Year
None Identified	-	-

Analysis Summary

The planning level estimate for the Trinity - Miller 500 kV transmission line is approximately **$215,000,000**. There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this 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 2019 regional assessment.

III.C Clay - Wansley 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 Clay 500 kV substation in Alabama within the Southern Balancing Authority Area and the other termination point at the Wansley 500 kV substation in Georgia within the Southern Balancing Authority Area.

Analysis Results

The tables below list any significant transmission projects included within the 2019 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 Balancing Authority Area 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 Balancing Authority Areas:

- AECI
- DEC
- DEPE
- DEPW
- GULF
- LG&E/KU
- PS
- SBAA
- TVA

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

Displaced Project	Planning Estimate	Project Year
None Identified	-	-

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

Facility	Constraint Type	Year
None Identified	-	-

Analysis Summary

The planning level estimate for the Clay - Wansley 500 kV transmission line is approximately **$428,900,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this 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 2019 regional assessment.

III.D South Hall - Branch 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as an 80-mile, 500 kV transmission line with one termination point at the South Hall 500 kV substation in Georgia within the Southern Balancing Authority Area and the other termination point at Branch 500 kV substation in Georgia within the Southern Balancing Authority Area.

Analysis Results

The tables below list any significant transmission projects included within the 2019 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 Balancing Authority Area 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 Balancing Authority Areas:

- AECI
- DEC
- DEPE
- DEPW
- GULF
- LG&E/KU
- PS
- SBAA
- TVA

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

Displaced Project	Planning Estimate	Project Year
None Identified	-	-

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

Facility	Constraint Type	Year
None Identified	-	-

Analysis Summary

The planning level estimate for the South Hall - Branch 500 kV transmission line is approximately **$327,400,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this 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 2019 regional assessment.

III.E Farley - Sinai 500 kV Transmission Line

Project Description

This alternative transmission project was evaluated as a 50-mile, 500 kV transmission line with one termination point at the Farley 500 kV substation in Alabama within the Southern Balancing Authority Area and the other termination point at Sinai 500 kV substation in Florida within the Gulf Power Balancing Authority Area.

Analysis Results

The tables below list any significant transmission projects included within the 2019 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 Balancing Authority Area 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 Balancing Authority Areas:

- AECI
- DEC
- DEPE
- DEPW
- GULF
- LG&E/KU
- PS
- SBAA
- TVA

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

Displaced Project	Planning Estimate	Project Year
None Identified	-	-

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

Facility	Constraint Type	Year
None Identified	-	-

Analysis Summary

The planning level estimate for the Farley - Sinai 500 kV transmission line is approximately **$292,100,000.** There were no potentially displaced transmission projects in the SERTP region identified in this evaluation and therefore, this 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 2019 regional assessment.

IV. Regional Analysis Conclusions

In the 2019 planning cycle, the SERTP Sponsors performed regional transmission planning analyses to assess the 2019 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 assessment of the 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 five (5), new potential transmission project alternatives evaluated were found to be more efficient or cost effective as compared to the transmission projects included in the 2019 regional transmission expansion plan. These results affirm that the current regional transmission plan contains transmission projects that reliably and cost-effectively address the transmission needs within the SERTP region for the 2019 planning cycle.

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, reflect 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 five (5) potential transmission project alternatives were more efficient or cost effective in meeting the transmission needs for the 2019 planning cycle, transmission planning is a very iterative process, with delivery needs and associated transmission projects constantly evolving. The 2019 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 2019 planning cycle, the SERTP sponsors will continue to assess current as well as newly-identified potential project alternatives, including if any or all these five (5) new potential transmission projects warrant continued consideration based upon any changes in forecasted assumptions.