SERTP 2014 Economic Study Results
-Preliminary-
Original: September 19th, 2014 / Revised: October 2nd, 2014

PowerSouth Energy Cooperative

Dalton Utilities

Southeastern Regional Transmission Planning Process

2014 Economic Planning Studies Preliminary Results

Original: September 19th, 2014 / Revised: October 2nd, 2014

Southern Company — Energy to Serve Your World℠

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Executive Summary

The Regional Planning Stakeholder Group ("RPSG") identified five Economic Planning Scenarios to be evaluated under the Southeastern Regional Transmission Planning ("SERTP") process. The SERTP Sponsors have performed analyses to assess the performance of the transmission systems of the participating Transmission Owners for these five hypothetical transfer scenarios. The assessments include the identification of potentially limiting facilities, the impact of the transfers on these facilities, and the contingency conditions causing the limitations. The assessments also provide potential solutions to alleviate the limitations, planning-level cost estimates, and the projected need-date for projects to accommodate the power flows associated with the transfers in the five Economic Planning Scenarios. Additionally, projects are identified as potential solutions to address the identified constraints and are based on the economic assumptions used in this study. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. The information contained in this report does not represent a commitment to proceed with the recommended enhancements nor implies that the recommended enhancements could be implemented by the study dates. The assessment cases model the currently projected improvements to the transmission system. However, changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. Planning staff of the participating Transmission Owners performed the assessments and the results are summarized in this report.

Study Assumptions

- The load levels evaluated were Summer Peak and

  Shoulder (93% of Summer Peak load) unless otherwise indicated below.
- Each request was evaluated for the particular year identified below, as selected by the RPSG
- The following Economic Planning Scenarios were assessed according to the reliability criteria of each of the participating Transmission Owners:
  - Santee Cooper Border to FRCC Border – 300 MW
    - Year: 2017
    - Load Level: Summer Peak and Shoulder
    - Type of Transfer: Load to Load
    - Source: Uniform load scale within the Santee Cooper border
    - Sink: Uniform load scale within the FRCC border using the participation factors shown in Table 1 below:

- FRCC Border to Santee Cooper Border – 300 MW
  - Year: 2017
  - Load Level: Summer Peak and Shoulder
  - Type of Transfer: Load to Load
  - Source: Uniform load scale within the FRCC border using the participation factors shown in Table 1 below:
  - Sink: Uniform load scale within the Santee Cooper border

Table 1: FRCC – Participation Factors

FRCC Area	Area #	Participation Factor (%)	MW Allocation
Florida Power & Light Company	401	60.2%	181
Duke Energy Florida	402	31.0%	93
JEA	406	7.4%	22
Tallahassee City Electric	415	1.4%	4
Total		**100.00%**	**300**

- TVA Border to Southern – 500 MW
  - Year: 2019
  - Load Level: Summer Peak and Shoulder
  - Type of Transfer: Generation to Generation
  - Source: A new generator interconnection to the existing Shelby 500kV substation (TVA)
  - Sink: Generation within Southern Company

- TVA Border to Southern – 1500 MW
  - Year: 2019
  - Load Level: Summer Peak and Shoulder
  - Type of Transfer: Generation to Generation
  - Source: A new generator interconnection to the existing Shelby 500kV substation (TVA)
  - Sink: Generation within Southern Company

- TVA Border to Duke Energy Carolinas/Duke Energy Progress – 1000 MW
  - Year: 2019
  - Load Level: Summer Peak and Shoulder
  - Type of Transfer: Generation to Load
  - Source: A new generator interconnection to the existing Shelby 500kV substation (TVA)
  - Sink: Uniform load scale within Duke Energy Carolinas/Duke Energy Progress using the participation factors shown in Table 2 below:

Table 2: Duke Energy – Participation Factors

Entity	Area #	Participation Factor (%)	MW Allocation
Duke Energy – Carolinas	342	60.7%	607
Duke Energy - Progress	340	36.7%	367
	341	2.6%	26
Total		**100.00%**	**1000**

- PSS/E and/or MUST were used for the study.
- Generation, interchange, and other assumptions were coordinated between participating Transmission Owners and Stakeholders.

Study Criteria

The study criteria with which results were evaluated included the following reliability elements:

- NERC Reliability Standards
- Individual company criteria (voltage, thermal, stability, and short circuit as applicable)

Case Development

- For all evaluations, the "2014 Series, Version 2A", cases were used as a starting point for the analysis of the Economic Planning Scenarios.

Methodology

- Initially, power flow analyses were performed based on the assumption that thermal limits were the controlling limit for the reliability plan. Voltage, stability, and short circuit studies were performed if circumstances warranted.

Technical Analysis and Study Results

The technical analysis was performed in accordance with the study methodology. Results from the technical analysis were reported throughout the study area to identify transmission elements approaching their limits such that all participating Transmission Owners and Stakeholders would be aware of any potential issues and, as such, suggest appropriate solutions to address the potential issues if necessary. The SERTP reported results on elements of 115 kV and greater within their respective service area based on:

- Thermal loadings greater than 100% (with potential solutions).

- Thermal loadings greater than 90% that increase with the addition of the transfer.
- Voltages appropriate to each participating Transmission Owner's planning criteria (with potential solutions if criteria were violated).

Assessment and Problem Identification

- The participating Transmission Owners ran assessments in order to identify any constraints within the participating Transmission Owners' footprint as a result of the Economic Planning Scenarios. Any constraints identified were documented and reviewed by each participating Transmission Owner.

Solution Development

- The participating Transmission Owners, with input from the Stakeholders, will develop potential solution alternatives due to the Economic Planning Scenarios requested by the stakeholders.
- The participating Transmission Owners will test the effectiveness of the potential solution alternatives using the same cases, methodologies, assumptions and criteria described above.
- The participating Transmission Owners will develop rough, planning-level cost estimates and construction schedules for the selected solution alternatives.

Report on the Study Results

The participating Transmission Owners compiled all the study results and prepared a report for review by the Stakeholders. The report contains the following:

- A description of the study approach and key assumptions for the Economic Planning Scenarios
- For each Economic Planning Scenario, the results of that study including:
  1. Limits to the transfer
  2. Selected solution alternatives to address the limit
  3. Rough, planning-level cost estimates and in-service dates for the selected solution alternatives

Santee Cooper Border to FRCC Border

300 MW

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Study Structure and Assumptions

Transfer Sensitivity	Transfer Amount	Transfer Source	Transfer Sink	Study Year
Santee Cooper Border to FRCC Border	300 MW	Santee Cooper Border	FRCC Border	2017
Load Flow Cases				
2014 Series Version 2A Cases: Summer Peak and Shoulder				
Source Modeled				
The source for this transfer was uniform load reduction within Santee Cooper Border.				

Transmission System Impacts

The 300 MW transfer from the Santee Cooper Border to FRCC Border results in no thermal constraints attributable to the requested transfer.

Southern Balancing Authority

Table 1.1. Pass 0 – Transmission System Impacts With No Enhancements – *Southern Balancing Authority*

The following table depicts loadings of transmission facilities in the Southern Balancing Authority ("SBA") that could become potential constraints in future years or with different queuing assumptions, but are not overloaded in the 2017 study year.

			Thermal Loadings (%)				
AREA	**Limiting Element**	**Rating (MVA)**	**Without Request**	**With Request**	**Contingency**	**Scenario**	**Project**
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	469 AVALON 115 1379 GUMLOG J 115 1	188	96.6	99.0	94 BIO 230 105 VANNA 230 1	1	--
SBA	94 BIO 230 105 VANNA 230 1	433	96.1	98.5	11 S HALL 500 306008 8OCONEE 500 1	2	--
SBA	199 OOSTANAULA 230 1122 DALTON 6 230 1	664	93.8	98.4	21 MOSTELLER 500 2499 CONASAUGA 500 1	11	--
SBA	4234 CLAY 6 230 5039 ARGO DS 230 1	602	97.4	97.9	4156 MILLER6 230 4157 MILLER8 500 1	10	--
SBA	472 AIRLINE 1 115 473 BIO B1 115 1	249	95.9	97.7	94 BIO 230 105 VANNA 230 1	1	--
SBA	1101 GEORGE DAM 115 1893 FT GAINES 115 1	125	96.4	97.5	715 CEDAR SP J 115 4594 WEBB 3 115 1	5	--

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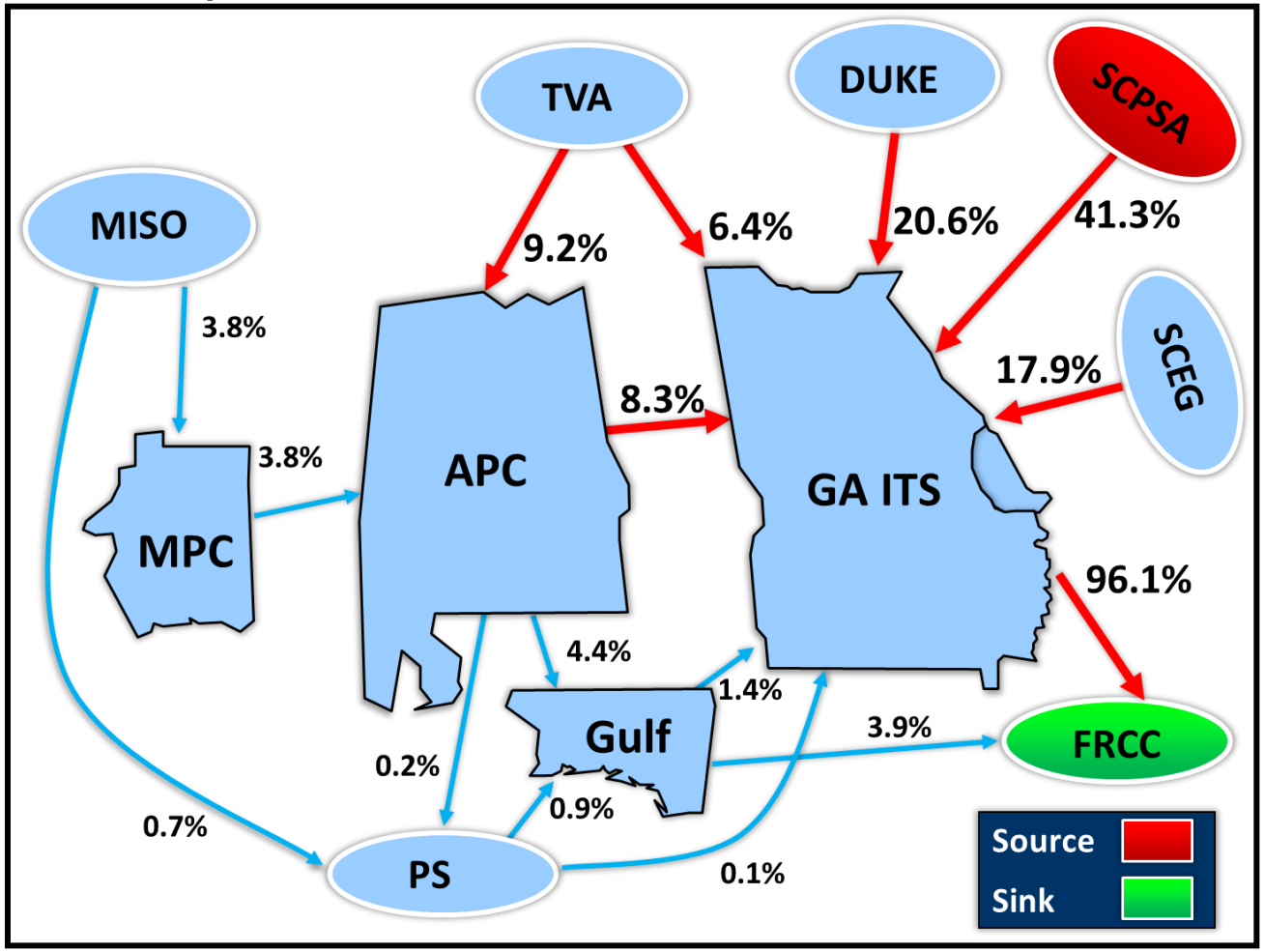
AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%)		Contingency	Scenario	Project
			Without Request	With Request			
SBA	8702 DANIEL6 230 8705 MPT EFR6 230 1	866	95.0	97.3	4642 BIG CK 6 230 8702 DANIEL6 230 1	5	--
SBA	701 N AMERIC B1 115 705 AMERICUS 115 1	155	95.4	96.1	705 AMERICUS 115 1582 N AMERIC B2 115 1	6	--
SBA	4638 CHICK 6 230 4700 BARRY 6 230 1	833	94.8	95.1	4638 CHICK 6 230 4642 BIG CK 6 230 1	3	--
SBA	104 LEXINGTON 230 339100 6RUSSEL 230 1	596	98.5	95.0	11 S HALL 500 306008 8OCONEE 500 1	2	--
SBA	4241 LEEDSTS6 230 5039 ARGO DS 230 1	602	94.2	94.7	4156 MILLER6 230 4157 MILLER8 500 1	10	--
SBA	9067 LT OGEE BS 115 9144 RICH HL TAP 115 1	255	90.7	94.7	2152 DORCHESTER 230 9051 LT OGEECHEE 230 1	3	--
SBA	471 N LAVONIA 115 2405 TNS JS 115 1	216	92.6	94.6	94 BIO 230 105 VANNA 230 1	1	--
SBA	4332 ATTALLA5 161 360283 5ALBERTVILLE 161 1	193	94.0	94.3	4234 CLAY 6 230 4247 ONEONTA6 230 1	12	--
SBA	4660 SPAN FT 115 4661 BELFORST 115 1	212	93.8	94.2	4638 CHICK 6 230 5341 EST SHR TAP 230 1	3	--
SBA	1044 DOUGLAS B1 115 1074 OAK PARK 115 1	100	90.6	92.5	1810 WILSONVILLE 230 1887 DOUGLAS B2 230 1	7	--
SBA	2218 BOX SPRINGS 230 3039 TALBOT CO 2 230 1	433	90.5	92.3	10 FORTSON 500 24 N TIFTON 500 1	8	--
SBA	461 JACKSON LK 115 1917 S COV J 115 1	71	90.3	92.0	746 S GRIFFIN 115 750 GA BRD CORR 115 1	4	--
SBA	1890 YELLOWPINEJ 115 1893 FT GAINES 115 1	125	90.6	91.8	715 CEDAR SP J 115 4594 WEBB 3 115 1	5	--
SBA	692 BLAKELY 2 115 1890 YELLOWPINEJ 115 1	125	90.6	91.8	715 CEDAR SP J 115 4594 WEBB 3 115 1	5	--
SBA	140 N AMERIC B1 230 701 N AMERIC B1 115 1	280	90.9	91.8	1581 N AMERIC B2 230 1582 N AMERIC B2 115 1	6	--
SBA	1581 N AMERIC B2 230 1582 N AMERIC B2 115 1	280	90.9	91.8	140 N AMERIC B1 230 701 N AMERIC B1 115 1	6	--
SBA	618 S COLUMBUS 115 1102 FT MITCH J 115 1	124	89.7	91.3	10 FORTSON 500 24 N TIFTON 500 1	8	--
SBA	1102 FT MITCH J 115 1114 FT BENN 2 115 1	124	89.3	91.2	10 FORTSON 500 24 N TIFTON 500 1	8	--
SBA	556 GOSHEN B1 115 1425 CLARK RD 115 1	124	89.1	91.1	117 WAYNESBORO 230 562 WAYNESBORO 115 1	8	--

Scenario Explanations:

1) McDonough Unit #5 Offline, Summer Peak Case
2) McDonough Unit #6 Offline, Summer Peak Case
3) Crist Offline, Summer Peak Case
4) McIntosh CC Unit #11 Offline, Summer Peak Case
5) Smith Unit #3 Offline, Summer Peak Case
6) Farley Unit #2 Offline, Summer Peak Case
7) Vogtle Unit #2 Offline, Summer Peak Case
8) Hatch Unit #2 Offline, Summer Peak Case
9) Bowen Unit #4 Offline, Summer Peak Case
10) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case
11) Hammond Offline, Summer Peak Case
12) Franklin Unit #2 Offline, Shoulder (93% Load Level) Case

Santee Cooper Border to FRCC Border: Transfer Flows within the SERTP



Note: Red arrows indicate transfer percentages of greater than 5%.

Potential Solutions for Identified Constraints

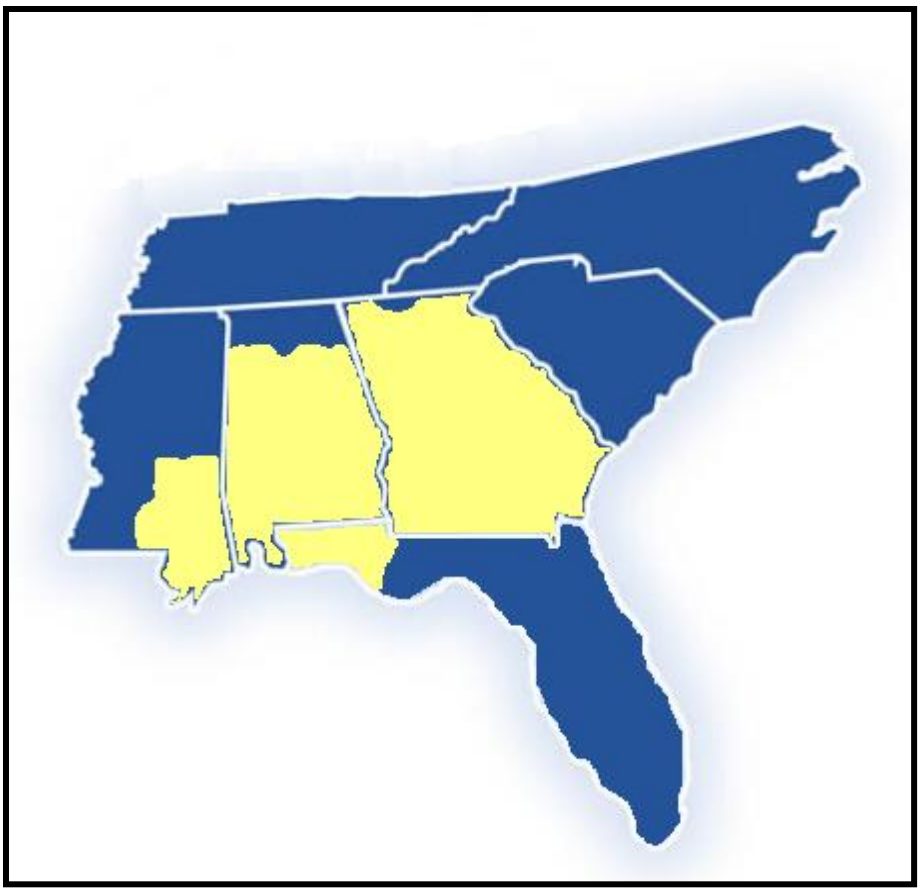
There were no identified constraints based on the assumptions used in this study, and therefore no potential solutions were identified. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. In addition, the current projected enhancements to the transmission system were modeled in the cases. Changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. These potential solutions only address constraints identified within the SERTP Sponsors' areas that are associated with the proposed transfer. Other Balancing Areas were not monitored which could result in additional limitations and required system improvements.

Table 1.2. Total Cost of the Santee Cooper Border to FRCC Border 300 MW Transfer

Area	Estimated Cost
TOTAL ($2014)	**$0**[(1)]

(1) Total cost does not include the cost of projects that are included in SERTP Sponsors' expansion plans and are scheduled to be completed by 06/1/2017. The studied transfer depends on these projects being in-service by 06/1/2017. If any of these projects are delayed or cancelled, the cost to support the study transfer could be greater than the total shown above.

Diagram 1.1. Approximate Location of Potential Solutions



Interchange Assumptions

Table 1.3 Incremental Transactions Preserved to those Modeled in Version 2A Cases

OASIS Ref. #	POR	POD	Amount (MW)
NS1117	DUKE	PS LOAD	50
NS1119	MISO	SMEPA LOAD	138
NS1117	MISO	PS LOAD	150
NL1112	MISO	SOCO	504
147615	DUKE	OPC LOAD	465
147613	TVA	OPC LOAD	310
NL1132	TVA	SOCO	500
946923	MISO	GTC	100
NL1132	MISO	SOCO	246
--	SOCO	FRCC	206
--	MEAG	FRCC	275
--	GTC	FRCC	875

Table 1.4 Capacity Benefit Margin Preserved (CBM)

Transmission Owner	Interface	Amount (MW)
Southern	Duke	350
Southern	TVA	400
Southern	MISO	100
Southern	SCPSA	125
Southern	SCEG	75

Table 1.5 Transmission Reliability Margins Preserved (TRM)

Transmission Owner	Interface	Amount (MW)
Southern	From Duke	196
GTC	From Duke	106
MEAG	From Duke	25
Dalton	From Duke	3
Southern	From MISO	204
Southern	From TVA	239
GTC	From TVA	52
MEAG	From TVA	12
Dalton	From TVA	2

FRCC Border to Santee Cooper Border

300 MW

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Transfer Sensitivity	Transfer Amount	Transfer Source	Transfer Sink	Study Year
FRCC Border to Santee Cooper Border	300 MW	FRCC Border	Santee Cooper Border	2017
Load Flow Cases				
2014 Series Version 2A Cases: Summer Peak and Shoulder				
Source Modeled				
The source for this transfer was uniform load reduction within FRCC Border.				

Transmission System Impacts

The 300 MW transfer from the FRCC Border to Santee Cooper Border results in no thermal constraints attributable to the requested transfer.

Southern Balancing Authority

Table 2.1. Pass 0 – Transmission System Impacts With No Proposed Enhancements – *Southern Balancing Authority*

The following table depicts loadings of transmission facilities in the Southern Balancing Authority ("SBA") that could become potential constraints in future years or with different queuing assumptions, but are not overloaded in the 2017 study year.

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	2102 HATCH SS 2 230 2361 VIDALIA B2 230 1	486	98.0	99.3	15 THALMANN 500 2158 MCCALL RD 500 1	1	--
SBA	817 SINCLAIRDAM 115 818 S DEVEREUX 115 1	57	96.5	98.8	1490 THOMSON 500 3052 WARTHEN 500 1	1	--
SBA	950 MAR 8 J 115 952 LOCKHEED JW 115 1	149	96.7	97.4	1262 MAR 14 JB 115 1988 SMYRNA B2 115 1	2	--
SBA	950 MAR 8 J 115 1260 MARIETTA JW 115 1	149	96.6	97.4	1262 MAR 14 JB 115 1988 SMYRNA B2 115 1	2	--
SBA	847 BAXLEY 115 848 PINE GRV DS 115 1	114	93.0	97.2	160 HATCH 230 2102 HATCH SS 2 230 1	1	--

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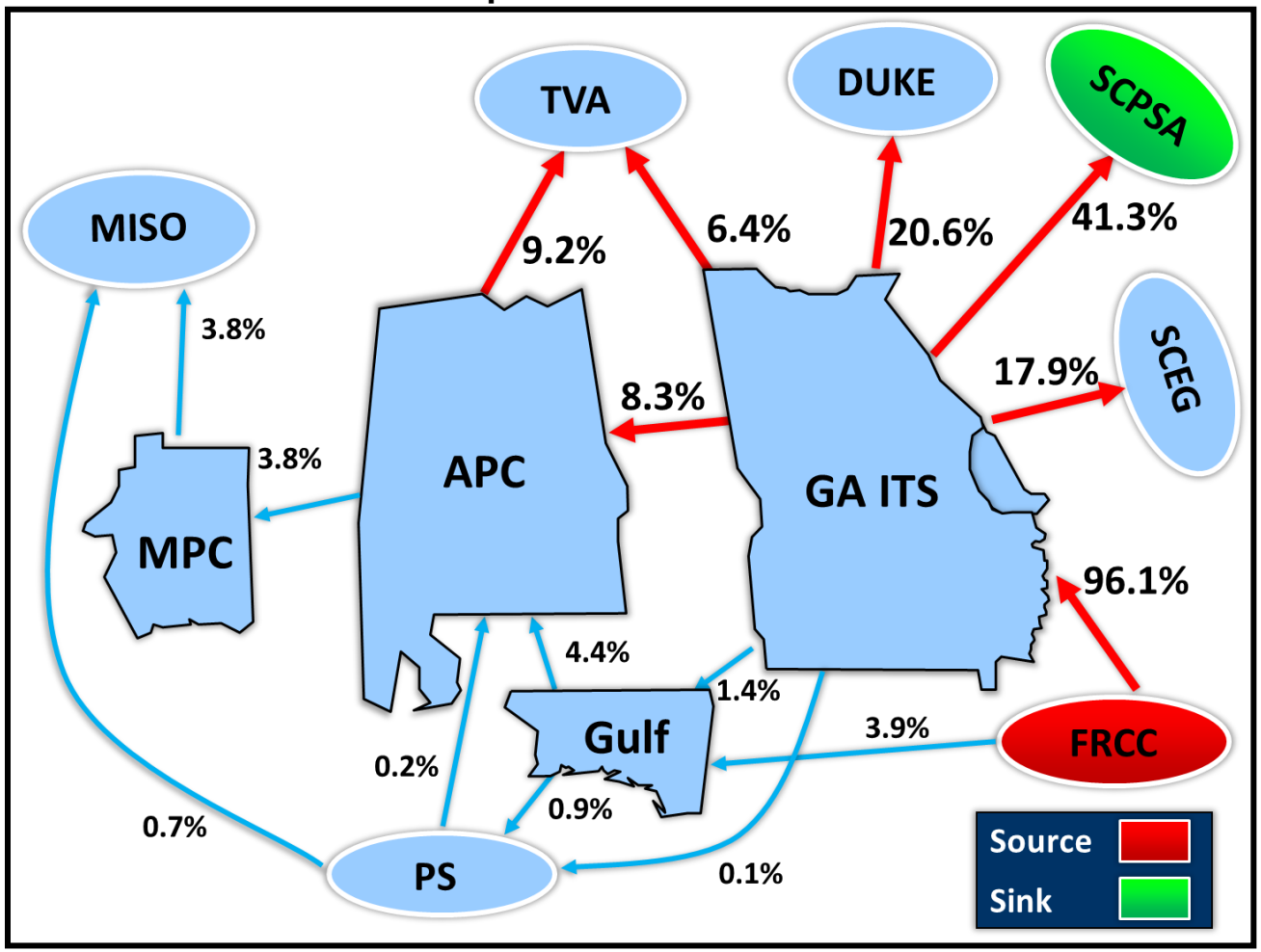
AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	160 HATCH 230 2102 HATCH SS 2 230 1	509	94.6	95.9	15 THALMANN 500 2158 MCCALL RD 500 1	1	--
SBA	9001 MCINTOSH 230 9021 MCINTOSH 115 1	319	89.6	93.0	370401 6OKATIE 230 370402 6JASPER1 230 1	3	--

Scenario Explanations:

1) Vogtle Unit #1 Offline, Summer Peak Case
2) Bowen Unit #4 Offline, Shoulder (93% Load Level) Case
3) Conasauga Offline, Summer Peak Case

FRCC Border to Santee Cooper Border: Transfer Flows within the SERTP



Note: Red arrows indicate transfer percentages of greater than 5%

Potential Solutions for Identified Constraints

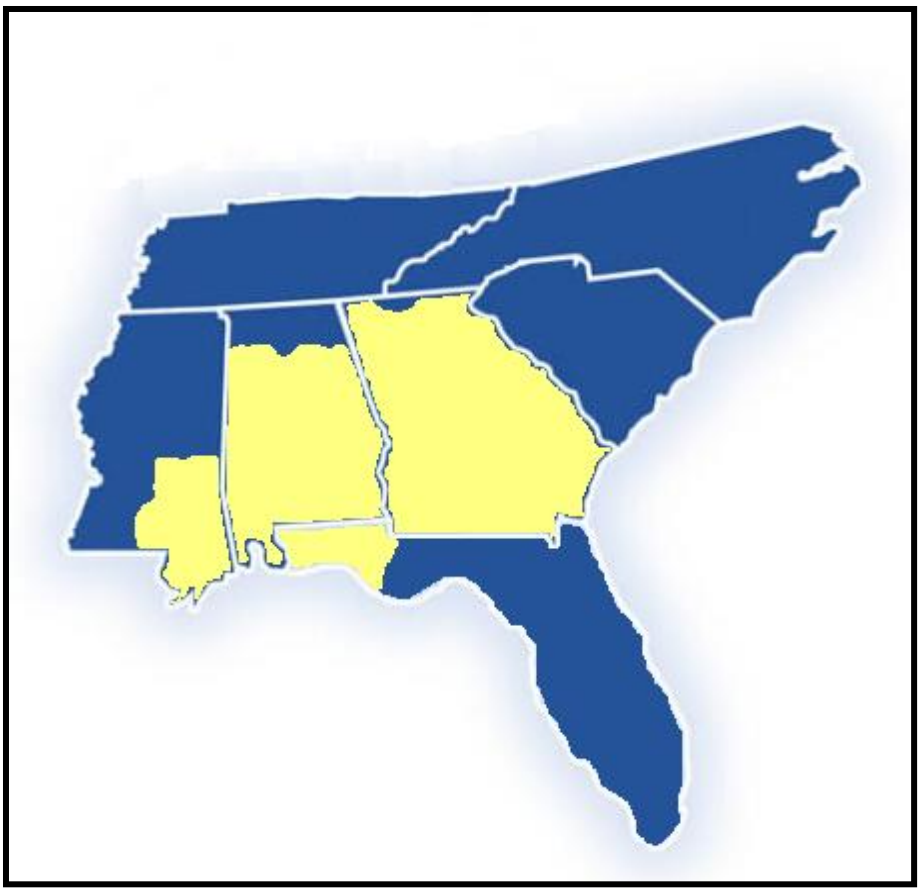
There were no identified constraints based on the assumptions used in this study, and therefore no potential solutions were identified. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. In addition, the current projected enhancements to the transmission system were modeled in the cases. Changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. These potential solutions only address constraints identified within the SERTP Sponsors' areas that are associated with the proposed transfer. Other Balancing Areas were not monitored which could result in additional limitations and required system improvements.

Table 2.2. Total Cost of the FRCC Border to Santee Cooper Border 300 MW Transfer

Area	Estimated Cost
TOTAL ($2014)	**$0**[(1)]

(1) Total cost does not include the cost of projects that are included in SERTP Sponsors' expansion plans and are scheduled to be completed by 06/1/2017. The studied transfer depends on these projects being in-service by 06/1/2017. If any of these projects are delayed or cancelled, the cost to support the study transfer could be greater than the total shown above.

Diagram 2.1. Approximate Location of Potential Solutions



Interchange Assumptions

Table 2.3 Incremental Transactions Preserved to those Modeled in Version 2A Cases

OASIS Ref. #	POR	POD	Amount (MW)
73509914	GTC	TVA	200
982928	SOCO	DUKE	60

Table 2.4 Transmission Reliability Margins Preserved (TRM)

Transmission Owner	Interface	Amount (MW)
Southern	From FL	37
GTC	From FL	19
MEAG	From FL	4
Dalton	From FL	1

TVA Border to Southern

500 MW

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Study Structure and Assumptions

Transfer Sensitivity	Transfer Amount	Transfer Source	Transfer Sink	Study Year
TVA Border to Southern	500 MW	TVA Border	Southern	2019
Load Flow Cases				
2014 Series Version 2A Cases: Summer Peak and Shoulder				
Source Modeled				
The source for this transfer was a new generator interconnection to the existing Shelby 500kV substation (TVA).				

Transmission System Impacts

Table 3.1 below identifies thermal constraints attributable to the requested transfer for the contingency and scenario that resulted in the highest facility loading for the conditions studied. Other unit out scenarios or contingencies may also result in constraints to these or other facilities.

Southern Balancing Authority

Table 3.1. Pass 0 – Transmission System Impacts With No Enhancements – ***Southern Balancing Authority***
The following table identifies significant constraints in the Southern Balancing Authority ("SBA") without any enhancements to the transmission system.

			Thermal Loadings (%)				
AREA	**Limiting Element**	**Rating (MVA)**	**Without Request**	**With Request**	**Contingency**	**Scenario**	**Project**
The following constraints have been identified as directly attributable to the above defined transfer.							
SBA	104 LEXINGTON 230 339100 6RUSSEL 230 1	596	98.5	102.8	11 S HALL 500 306008 8OCONEE 500 1	1	P1
SBA	4121 FAYET TS 161 4127 FAY COTN 161 1	193	103.9(1)	117.8	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4127 FAY COTN 161 4979 BANKSTON 161 1	193	103.7(1)	117.6	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4128 JWALTTP 161 4979 BANKSTON 161 1	193	102.1(1)	115.9	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4128 JWALTTP 161 4978 BERRY 161 1	193	93.5	107.3	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4131 OAKMANTP 161 4978 BERRY 161 1	193	91.2	104.8	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4131 OAKMANTP 161 4135 GORGAS 161 1	193	90.5	104.1	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	4234 CLAY 6 230 5039 ARGO DS 230 1	602	97.4	100.6	4157 MILLER8 500 4375 S.BESS 8 500 1	3	P3

(1) A current operating procedure is sufficient to alleviate this identified constraint without the addition of the proposed transfer. However, the additional transfer exacerbates the loading on this transmission facility such that the operating procedure becomes insufficient.

Scenario Explanations:

1) McDonough Unit #6 Offline, Summer Peak Case
2) Gorgas Unit #10 Offline, Shoulder (93% Load Level) Case
3) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case

Table 3.2. Pass 1 – Transmission System Impacts with All Proposed Enhancements – *Southern Balancing Authority*

The following table depicts loadings of transmission facilities in the Southern Balancing Authority ("SBA") that could become potential constraints in future years or with different queuing assumptions, but are not overloaded in the 2019 study year.

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	4644 N THEO 6 230 8710 MOSSPT E6 230 1	602	92.8	99.9	4642 BIG CK 6 230 8702 DANIEL6 230 1	1	--
SBA	4332 ATTALLA5 161 360283 5ALBERTVILLE 161 1	193	94.0	99.5	4157 MILLER8 500 5312 CLAY 8 500 1	2	--
SBA	8702 DANIEL6 230 8710 MOSSPT E6 230 1	866	95.0	98.7	4157 MILLER8 500 5312 CLAY 8 500 1	5	--
SBA	4678 TANERWIL 115 8832 HARLESTN 115 1	107	97.2	98.7	4642 BIG CK 6 230 8702 DANIEL6 230 1	1	--
SBA	4638 CHICK 6 230 4700 BARRY 6 230 1	833	98.4	98.5	4638 CHICK 6 230 4642 BIG CK 6 230 1	1	--
SBA	4156 MILLER6 230 4172 BOYLESM1 230 1	602	97.8	98.4	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	888 DALTON 115 892 E DALTON B2 115 2	188	97.1	98.3	888 DALTON 115 892 E DALTON B2 115 1	8	--
SBA	888 DALTON 115 892 E DALTON B2 115 1	188	96.6	97.8	888 DALTON 115 892 E DALTON B2 115 2	8	--
SBA	199 OOSTANAULA 230 1122 DALTON 6 230 1	664	93.8	97.4	21 MOSTELLER 500 2499 CONASAUGA 500 1	8	--
SBA	718 S COWETA B2 115 876 BROOKS 115 1	155	92.4	94.4	1629 WOOLSEY 230 2771 OHARA B1 230 1	6	--
SBA	7311 SHOAL RV3 115 7324 VALPARAI B2 115 1	124	92.6	94.4	7324 VALPARAI B2 115 7325 VALPARAI B1 115 1	5	--

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AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	8420 NASA 115 8426 LOGTWN W3 115 1	216	92.0	94.1	8400 KILN 6 230 8425 LOGTWN W6 230 1	9	--
SBA	2766 S HALL B1 230 3067 CANDLER 230 1	509	94.3	94.0	3 NORCROSS 500 11 S HALL 500 1	3	--
SBA	4126 KING JCT 161 4866 S.VERNTP 161 1	377	86.7	93.3	4157 MILLER8 500 5307 WVERN SS8 500 1	10	--
SBA	611 N COLUMBUS 115 613 FIRST AV B2 115 1	149	89.4	93.3	130 GOAT ROCK 230 609 GOAT ROCK 115 1	11	--
SBA	461 JACKSON LK 115 1917 S COV J 115 1	71	85.0	93.1	746 S GRIFFIN 115 750 GA BRD CORR 115 1	12	--
SBA	4261 ALAMETAL 115 5944 PRATCTY B2 115 1	246	90.8	92.6	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	4156 MILLER6 230 4157 MILLER8 500 1	1613	90.7	92.4	4157 MILLER8 500 4375 S.BESS 8 500 1	10	--
SBA	4260 SO PARK 115 4261 ALAMETAL 115 1	246	90.5	92.4	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	888 DALTON 115 893 DALTON 9 115 1	216	89.7	92.2	1122 DALTON 6 230 2498 LOOPERS ITS 230 1	8	--
SBA	4643 BIG CK 3 115 4678 TANERWIL 115 1	107	89.8	91.3	4642 BIG CK 6 230 8702 DANIEL6 230 1	1	--
SBA	4485 FAUNSDAL 115 4744 SONGALTP 115 1	138	89.2	91.0	4471 GREENCO6 230 4489 N SELMA6 230 1	13	--
SBA	3 NORCROSS 500 2620 NORCROS LS2 230 1	2016	90.8	90.9	3 NORCROSS 500 65 NORCROS LS1 230 1	3	--
SBA	847 BAXLEY 115 1098 BRENTWOOD 115 1	91	88.7	90.7	8 VOGTLE 500 9 W MCINTOSH 500 1	4	--
SBA	4233 CLAY 3 115 4234 CLAY 6 230 1	477	89.0	90.6	4234 CLAY 6 230 5039 ARGO DS 230 1	2	--
SBA	1135 MCGRAU F B1 230 1931 R_HOPEWL 230 1	509	87.9	90.1	20 BOWEN 500 21 MOSTELLER 500 1	3	--
SBA	130 GOAT ROCK 230 609 GOAT ROCK 115 1	312	87.1	90.0	131 FIRST AV B1 230 612 FIRST AV B1 115 1	14	--

Scenario Explanations:

1) Crist Offline, Summer Peak Case
2) Hillabee Offline, Shoulder (93% Load Level) Case
3) McDonough Unit #6 Offline, Summer Peak Case
4) McIntosh CC Unit #11 Offline, Summer Peak Case
5) Smith Unit #3 Offline, Summer Peak Case
6) Vogtle Unit #1 Offline, Summer Peak Case
7) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case
8) Hammond Offline, Summer Peak Case
9) Watson Unit #5 Offline, Summer Peak Case
10) Gorgas Unit #10 Offline, Shoulder (93% Load Level) Case
11) Scherer Unit #1 Offline, Shoulder (93% Load Level) Case
12) Yates Unit #7 Offline, Summer Peak Case
13) Harris Unit #1 Offline, Shoulder (93% Load Level) Case
14) Greene County Unit #2 Offline, Shoulder (93% Load Level) Case

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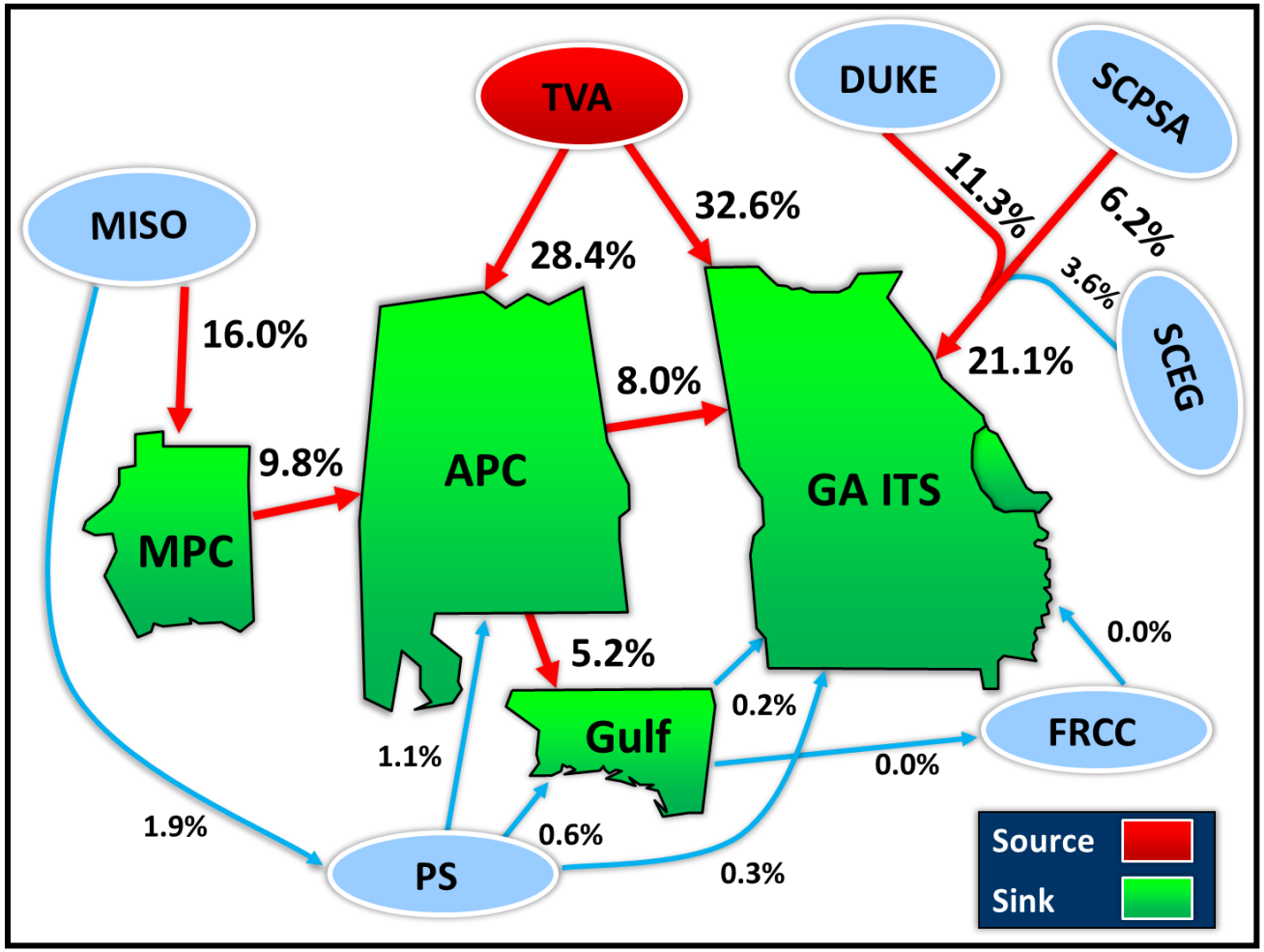
TVA Border to Southern: Transfer Flows within the SERTP



Note: Red arrows indicate transfer percentages of greater than 5%.

Potential Solutions for Identified Constraints

The following projects are potential solutions to address the identified constraints and are based on the assumptions used in this study. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. In addition, the current projected enhancements to the transmission system were modeled in the cases. Changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. These potential solutions only address constraints identified within the SERTP Sponsors' areas that are associated with the proposed transfer. Other Balancing Areas were not monitored which could result in additional limitations and required system improvements.

Table 3.3. Potential Solutions for Identified Constraints – *Southern Balancing Authority*

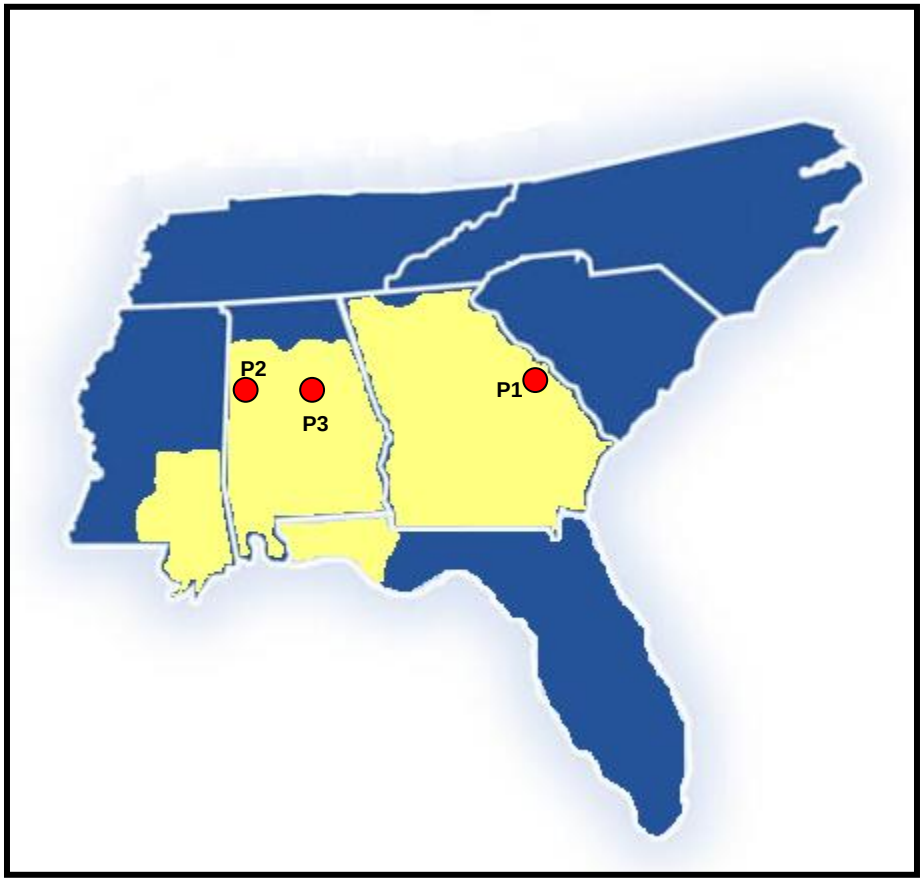
Item	Potential Solution	Estimated Need Date	Estimated Cost
P1	**Russell Dam – Athena 230 kV T.L.** • Construct approximately 53 miles of new 230 kV transmission line from Russell Dam to Athena with bundled (2) 1351 ACSR at 100°C.	2019	$82,000,000
P2	**Fayette – Gorgas 161 kV T.L.** • Rebuild approximately 38.8 miles along the Fayette – Gorgas 161 kV transmission line with 1351 ACSR at 100 °C.	2019	$31,500,000
P3	**Clay TS – Leeds TS 230 kV T.L.** • Reconductor approximately 17.3 miles along the Clay – Leeds 230 kV transmission line with bundled (2) 1351 ACSR at 100 °C.	2019	$22,200,000
SBA Total ($2014)			$135,700,000

Table 3.4. Total Cost of the TVA Border to Southern 500 MW Transfer

Area	Estimated Cost
TOTAL ($2014)	**$135,700,000[(1)]**

[(1)] Total cost does not include the cost of projects that are included in SERTP Sponsors' expansion plans and are scheduled to be completed by 6/1/2019. The studied transfer depends on these projects being in-service by 6/1/2019. If any of these projects are delayed or cancelled, the cost to support the study transfer could be greater than the total shown above.

Diagram 3.1. Approximate Location of Potential Solutions



Interchange Assumptions

Table 3.5 Incremental Transactions Preserved to those Modeled in Version 2A Cases

OASIS Ref. #	POR	POD	Amount (MW)
NS1117	DUKE	PS LOAD	50
NS1119	MISO	SMEPA LOAD	140
NS1117	MISO	PS LOAD	150
NL1112	MISO	SOCO	504
147615	DUKE	OPC LOAD	465
147613	TVA	OPC LOAD	310
NL1132	TVA	SOCO	500
946923	MISO	GTC	100
NL1132	MISO	SOCO	246
982928	SOCO	DUKE	60

Table 3.6 Capacity Benefit Margin Preserved (CBM)

Transmission Owner	Interface	Amount (MW)
Southern	Duke	350
Southern	TVA	400
Southern	MISO	100
Southern	SCPSA	125
Southern	SCEG	75

Table 3.7 Transmission Reliability Margins Preserved (TRM)

Transmission Owner	Interface	Amount (MW)
Southern	From Duke	196
GTC	From Duke	106
MEAG	From Duke	25
Dalton	From Duke	3
Southern	From MISO	204
Southern	From TVA	239
GTC	From TVA	52
MEAG	From TVA	12
Dalton	From TVA	2

TVA Border to Southern

1500 MW

Study Structure and Assumptions

Transfer Sensitivity	Transfer Amount	Transfer Source	Transfer Sink	Study Year
TVA Border to Southern	1500 MW	TVA Border	Southern	2019
Load Flow Cases				
2014 Series Version 2A Cases: Summer Peak and Shoulder				
Source Modeled				
The source for this transfer was a new generator interconnection to the existing Shelby 500kV substation (TVA).				

Transmission System Impacts

Tables 4.1 – 4.2 below identify thermal constraints attributable to the requested transfer for the contingency and scenario that resulted in the highest facility loading for the conditions studied. Other unit out scenarios or contingencies may also result in constraints to these or other facilities.

Southern Balancing Authority

Table 4.1. Pass 0 – Transmission System Impacts With No Enhancements – *Southern Balancing Authority*
The following table identifies significant constraints in the Southern Balancing Authority ("SBA") without any enhancements to the transmission system.

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following constraints have been identified as directly attributable to the above defined transfer.							
SBA	199 OOSTANAULA 230 1122 DALTON 6 230 1	664	93.8	109.1	21 MOSTELLER 500 2499 CONASAUGA 500 1	1	P1
SBA	104 LEXINGTON 230 339100 6RUSSEL 230 1	596	98.5	106.8	11 S HALL 500 306008 8OCONEE 500 1	2	P1
SBA	2766 S HALL B1 230 3067 CANDLER 230 1	509	95.9	104.3	3 NORCROSS 500 11 S HALL 500 1	2	P1
SBA	2499 CONASAUGA 500 360662 8BRADLEY TN 500 1[(1)]	2598	90.2	104.1	11 S HALL 500 306008 8OCONEE 500 1	3	P1

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AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	94 BIO 230 105 VANNA 230 1	433	99.6	103.4	11 S HALL 500 306008 8OCONEE 500 1	2	P1
SBA	104 LEXINGTON 230 133 R_E WATKNVL 230 1	602	94.7	102.6	11 S HALL 500 306008 8OCONEE 500 1	2	P1
SBA	4156 MILLER6 230 4157 MILLER8 500 1	1613	90.7	102.0	4157 MILLER8 500 4375 S.BESS 8 500 1	4	P1
SBA	102 E WATKNS B1 230 492 E WATKINSVL 115 1	332	90.4	100.3	102 E WATKNS B1 230 122 E WATKNS B2 230 1	2	P1
SBA	87 R_VANNA 230 99 NEW HAVEN 230 1	433	84.2	100.2	11 S HALL 500 306008 8OCONEE 500 1	2	P1

(1) The limiting element of this tie-line constraint is located within TVA.

Scenario Explanations:

1) Hammond Offline, Summer Peak Case
2) McDonough Unit #6 Offline, Summer Peak Case
3) Conasauga Unit Offline, Summer Peak Case
4) Gorgas Offline, Shoulder (93% Load Level) Case

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Table 4.2. Pass 1 – Transmission System Impacts with Proposed Enhancement "P1" – *Southern*

The following table identifies significant constraints in the Southern Balancing Authority ("SBA") with the proposed enhancement "P1" applied to the transmission system. Enhancements were identified to alleviate these constraints.

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AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	4121 FAYET TS 161 4127 FAY COTN 161 1	193	103.9(1)	129.5	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4127 FAY COTN 161 4979 BANKSTON 161 1	193	103.7(1)	129.3	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4128 JWALTTP 161 4979 BANKSTON 161 1	193	102.1(1)	127.6	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4128 JWALTTP 161 4978 BERRY 161 1	193	93.5	118.9	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4131 OAKMANTP 161 4978 BERRY 161 1	193	91.2	116.4	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4131 OAKMANTP 161 4135 GORGAS 161 1	193	90.5	115.7	4157 MILLER8 500 5307 WVERN SS8 500 1	2	P2
SBA	4234 CLAY 6 230 5039 ARGO DS 230 1	602	97.4	103.0	4157 MILLER8 500 4375 S.BESS 8 500 1	1	P3
SBA	4332 ATTALLA5 161 360283 5ALBERTVILLE 161 1	193	94.0	107.5	4157 MILLER8 500 5312 CLAY 8 500 1	1	P4
SBA	8280 COLLINS 115 336760 3MAGEE 115 1	100	88.9	105.7	8270 HATBG SW6 230 8310 PURVIS B1 230 1	3	P5
SBA	4156 MILLER6 230 4172 BOYLESM1 230 1	602	97.8	103.9	4157 MILLER8 500 5312 CLAY 8 500 1	1	P6

(1) A current operating procedure is sufficient to alleviate this identified constraint without the addition of the proposed transfer. However, the additional transfer exacerbates the loading on this transmission facility such that the operating procedure becomes insufficient.

Scenario Explanations:

1) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case
2) Gorgas Unit #10 Offline, Summer Peak Case
3) Ratcliffe Offline, Summer Peak Case

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Table 4.3. Pass 3 – Transmission System Impacts with All Proposed Enhancements – *Southern Balancing Authority*

The following table depicts loadings of transmission facilities in the Southern Balancing Authority ("SBA") that could become potential constraints in future years or with different queuing assumptions, but are not overloaded in the 2019 study year.

			Thermal Loadings (%)				
AREA	Limiting Element	Rating (MVA)	Without Request	With Request	Contingency	Scenario	Project
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	251 E POINT B2 115 264 E POINT 4 115 1	187	98.4	99.6	240 E POINT B1 115 303 COL PK 3 JN 115 1	1	--
SBA	52 N SPRINGS 230 2627 BULL SLU B2 230 1	539	85.8	99.2	3 NORCROSS 500 4 BULL SLUICE 500 1	1	--
SBA	461 JACKSON LK 115 1917 S COV J 115 1	71	84.2	98.0	746 S GRIFFIN 115 750 GA BRD CORR 115 1	1	--
SBA	104 LEXINGTON 230 339100 6RUSSEL 230 1	596	98.5	97.6	11 S HALL 500 306008 8OCONEE 500 1	9	--
SBA	47 SANDY SPR 230 2626 BULL SLU B1 230 1	596	88.4	96.8	50 BULL SLU LS 230 2627 BULL SLU B2 230 1	3	--
SBA	94 BIO 230 105 VANNA 230 1	433	97.7	96.6	11 S HALL 500 306008 8OCONEE 500 1	3	--
SBA	2766 S HALL B1 230 3067 CANDLER 230 1	509	95.9	96.4	3 NORCROSS 500 11 S HALL 500 1	9	--
SBA	4755 FULTON 115 5293 BASSETTCK3 115 1	112	85.0	96.1	5065 LPAC TP 115 5293 BASSETTCK3 115 1	4	--
SBA	8702 DANIEL6 230 8710 MOSSPT E6 230 1	866	95.0	95.6	4642 BIG CK 6 230 8702 DANIEL6 230 1	7	--
SBA	4644 N THEO 6 230 8710 MOSSPT E6 230 1	602	92.8	95.5	4642 BIG CK 6 230 8702 DANIEL6 230 1	6	--
SBA	52 N SPRINGS 230 1229 NORTHPARK 230 1	539	81.0	95.5	3 NORCROSS 500 4 BULL SLUICE 500 1	1	--
SBA	718 S COWETA B2 115 876 BROOKS 115 1	155	92.4	95.3	1629 WOOLSEY 230 2771 OHARA B1 230 1	1	--
SBA	4126 KING JCT 161 4866 S.VERNTP 161 1	377	82.1	95.0	4157 MILLER8 500 5307 WVERN SS8 500 1	5	--
SBA	240 E POINT B1 115 303 COL PK 3 JN 115 1	135	93.4	95.0	251 E POINT B2 115 264 E POINT 4 115 1	1	--
SBA	4156 MILLER6 230 4157 MILLER8 500 1	1613	90.7	94.7	4157 MILLER8 500 4375 S.BESS 8 500 1	5	--
SBA	8273 HWY 11 115 8275 HBG CNTY 115 1	138	93.0	94.1	8245 PETAL 115 8252 HATBG NO B2 115 1	6	--
SBA	8351 HURR 115 115 8555 WIGNS SS 115 1	107	92.7	94.0	8529 LANDON B1 115 8532 HWY 53 115 1	10	--
SBA	3 NORCROSS 500 2620 NORCROS LS2 230 1	2016	90.3	93.8	3 NORCROSS 500 65 NORCROS LS1 230 1	3	--
SBA	104 LEXINGTON 230 133 R_E WATKNVL 230 1	602	94.7	93.5	11 S HALL 500 306008 8OCONEE 500 1	9	--
SBA	47 SANDY SPR 230 2626 BULL SLU B1 230 1	596	83.9	93.1	50 BULL SLU LS 230 2627 BULL SLU B2 230 1	3	--
SBA	611 N COLUMBUS 115 613 FIRST AV B2 115 1	149	89.8	92.8	130 GOAT ROCK 230 609 GOAT ROCK 115 1	3	--
SBA	464 N CONYERS 115 465 CONYERS 115 1	187	85.4	92.7	1210 SMYRNA CH 230 2668 KLONDIKE B1 230 1	1	--
SBA	4660 SPAN FT 115 4661 BELFORST 115 1	212	91.4	92.5	4638 CHICK 6 230 5341 EST SHR TAP 230 1	6	--
SBA	3067 CANDLER 230 3073 BRASELTON 230 1	509	90.4	92.1	3 NORCROSS 500 11 S HALL 500 1	9	--
SBA	5702 WVERN SS5 161 360234 5LOWNDES MS 161 1	405	86.8	90.7	4157 MILLER8 500 5307 WVERN SS8 500 1	5	--
SBA	130 GOAT ROCK 230 609 GOAT ROCK 115 1	312	87.8	90.7	131 FIRST AV B1 230 612 FIRST AV B1 115 1	6	--

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AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	17179 BRWTN ST 46. 17182 ANDLUSA1 46. 1	25	88.6	90.3	17181 ANDLUSA3 115 17285 FIVRUNSJ 115 1	8	--
SBA	4121 FAYET TS 161 4126 KING JCT 161 1	377	77.6	90.2	4157 MILLER8 500 5307 WVERN SS8 500 1	5	--
SBA	36 JACK MCD B2 230 41 PEACHTREE 230 1	1192	88.2	90.1	4 BULL SLUICE 500 19 BIG SHANTY 500 1	1	--
SBA	208 NELSON 230 954 NELSON 115 2	176	88.5	90.1	208 NELSON 230 954 NELSON 115 1	1	--

Scenario Explanations:

1) Vogtle Unit #1 Offline, Summer Peak Case
2) McIntosh CC Unit #11 Offline, Summer Peak Case
3) McDonough Unit #6 Offline, Summer Peak Case
4) Greene County Unit #1 Offline, Shoulder (93% Load Level) Case
5) Gorgas Unit #10 Offline, Shoulder (93% Load Level) Case
6) Crist Offline, Summer Peak Case
7) Smith Unit #3 Offline, Summer Peak Case
8) Franklin Unit #2 Offline, Shoulder (93% Load Level) Case
9) Wansley Unit #7 Offline, Summer Peak Case
10) Ratcliffe Offline, Summer Peak Case

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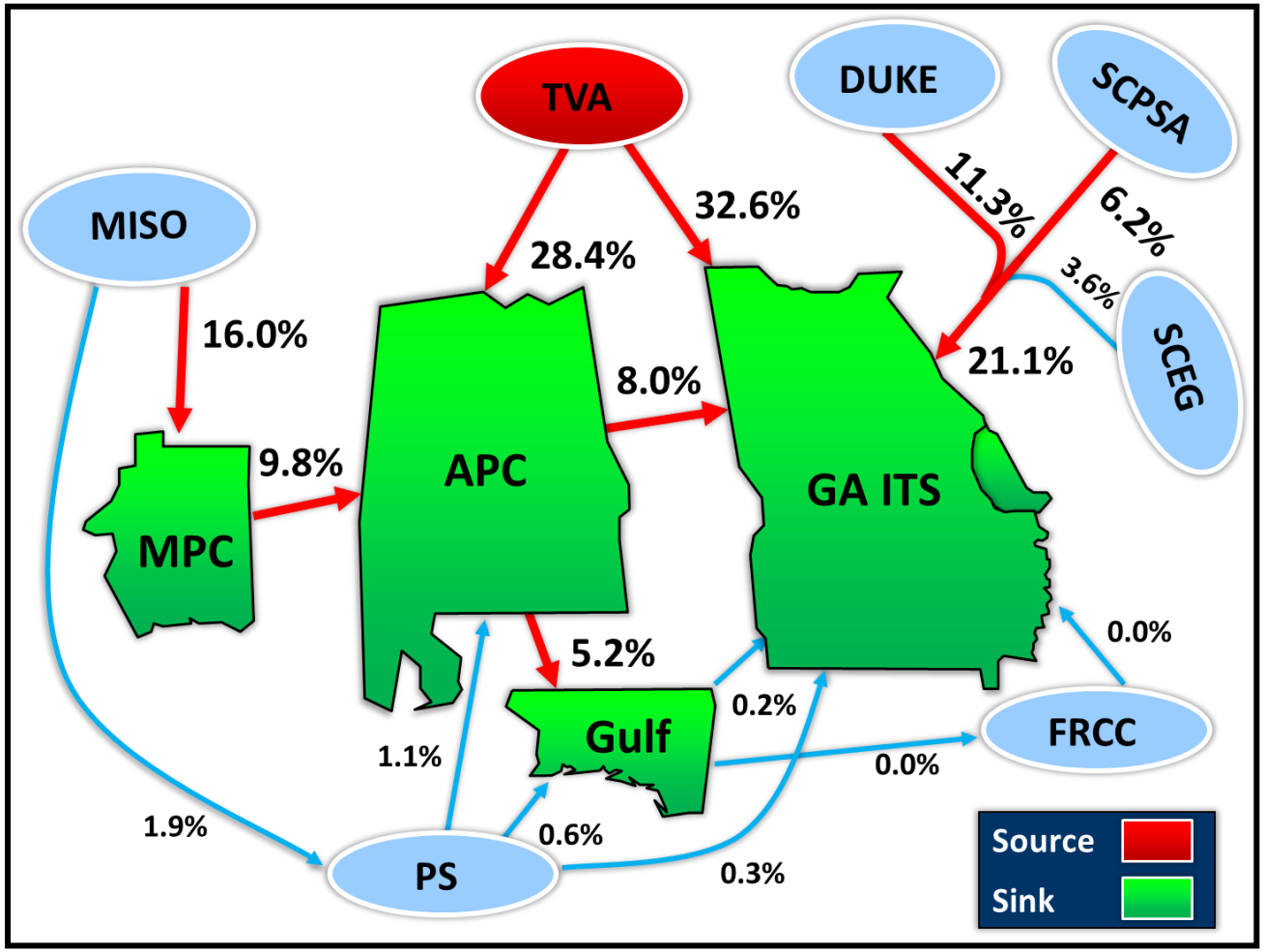
TVA Border to Southern: Transfer Flows within the SERTP



Note: Red arrows indicate transfer percentages of greater than 5%.

Potential Solutions for Identified Constraints

The following projects are potential solutions to address the identified constraints and are based on the assumptions used in this study. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. In addition, the current projected enhancements to the transmission system were modeled in the cases. Changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. These potential solutions only address constraints identified within the SERTP Sponsors' areas that are associated with the proposed transfer. Other Balancing Areas were not monitored which could result in additional limitations and required system improvements.

Table 4.4. Potential Solutions for Identified Constraints – *Southern Balancing Authority*

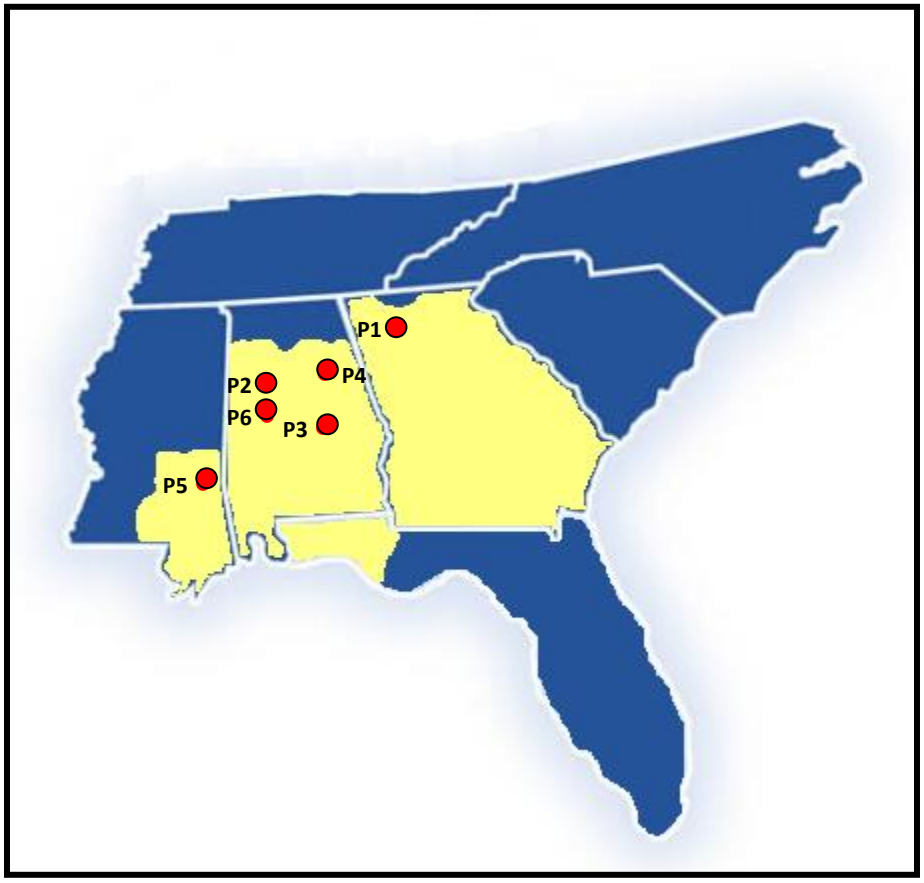
Item	Potential Solution	Estimated Need Date	Estimated Cost
P1	**Widows Creek (TVA) – Bowen 500 kV T.L.** • Construct approximately 60 miles of a new 122 mile 500 kV transmission line from Widows Creek (TVA) to Bowen (SOCO) with bundled (3) 1113 ACSR at 100°C and upgrade terminal equipment at Widows Creek (TVA) 500 kV substation. (Southern's portion of the line – 60 miles)	2019	$185,000,000
P2	**Fayette – Gorgas 161 kV T.L.** • Rebuild approximately 38.8 miles along the Fayette – Gorgas 161 kV transmission line with 1351 ACSR at 100 °C.	2019	$31,500,000
P3	**Clay TS – Leeds TS 230 kV T.L.** • Reconductor approximately 17.3 miles along the Clay – Leeds 230 kV transmission line with bundled (2) 1351 ACSR at 100 °C.	2019	$22,200,000
P4	**Attalla – Albertville (TVA) 161 kV T.L.** • Reconductor approximately 19.6 miles with 1351 ACSR at 100°C from Attalla to Albertville 161 kV transmission line (SOCO)	2019	$19,500,000
P5	**Collins – Magee 115 kV T.L.** • Reconductor approximately 8.5 miles of the Collins – Magee 115 kV transmission line with 795 ACSR at 100 °C.	2019	$3,000,000
P6	**Miller – Boyles 230 kV T.L.** • Construct approximately 6.2 miles of new 230 kV transmission line from Boyles to ACIPCO with 1351 ACSS at 200°C.	2019	$16,000,000
SBA Total ($2014)			$277,200,000

Table 4.5. Total Cost of the TVA Border to Southern 1500 MW Transfer

Area	Estimated Cost
TOTAL ($2014)	**$277,200,000[(1)]**

[(1)] Total cost does not include the cost of projects that are included in SERTP Sponsors' expansion plans and are scheduled to be completed by 6/1/2019. The studied transfer depends on these projects being in-service by 6/1/2019. If any of these projects are delayed or cancelled, the cost to support the study transfer could be greater than the total shown above.

Diagram 4.1. Approximate Location of Potential Solutions



Interchange Assumptions

Table 4.6. Incremental Transactions Preserved to those Modeled in Version 2A Cases

OASIS Ref. #	POR	POD	Amount (MW)
NS1117	DUKE	PS LOAD	50
NS1119	MISO	SMEPA LOAD	140
NS1117	MISO	PS LOAD	150
NL1112	MISO	SOCO	504
147615	DUKE	OPC LOAD	465
147613	TVA	OPC LOAD	310
NL1132	TVA	SOCO	500
946923	MISO	GTC	100
NL1132	MISO	SOCO	246
982928	SOCO	DUKE	60

Table 4.7 Capacity Benefit Margin Preserved (CBM)

Transmission Owner	Interface	Amount (MW)
Southern	Duke	350
Southern	TVA	400
Southern	MISO	100
Southern	SCPSA	125
Southern	SCEG	75

Table 4.8 Transmission Reliability Margins Preserved (TRM)

Transmission Owner	Interface	Amount (MW)
Southern	From Duke	196
GTC	From Duke	106
MEAG	From Duke	25
Dalton	From Duke	3
Southern	From MISO	204
Southern	From TVA	239
GTC	From TVA	52
MEAG	From TVA	12
Dalton	From TVA	2

TVA Border to Duke Energy

1000 MW

Study Structure and Assumptions

Transfer Sensitivity	Transfer Amount	Transfer Source	Transfer Sink	Study Year
TVA Border to Duke Energy	1000 MW	TVA	DUKE	2019
Load Flow Cases				
2014 Series Version 2A Cases: Summer Peak and Shoulder				
Source Modeled				
The source for this transfer was a new generator interconnection to the existing Shelby 500kV substation (TVA).				

Transmission System Impacts

Table 5.1 below identifies thermal constraints attributable to the requested transfer for the contingency and scenario that resulted in the highest facility loading for the conditions studied. Other unit out scenarios or contingencies may also result in constraints to these or other facilities.

Southern Balancing Authority

Table 5.1. Pass 0 – Transmission System Impacts With No Enhancements – *Southern Balancing Authority*
The following table identifies significant constraints in the Southern Balancing Authority ("SBA") without any enhancements to the transmission system.

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following constraints have been identified as directly attributable to the above defined transfer.							
SBA	4121 FAYET TS 161 4127 FAY COTN 161 1	193	103.9(1)	130.8	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1
SBA	4127 FAY COTN 161 4979 BANKSTON 161 1	193	103.7(1)	129.6	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1
SBA	4128 JWALTTP 161 4979 BANKSTON 161 1	193	102.1(1)	127.4	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1
SBA	4128 JWALTTP 161 4978 BERRY 161 1	193	93.5	116.3	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1
SBA	4131 OAKMANTP 161 4978 BERRY 161 1	193	91.2	113.0	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1
SBA	4131 OAKMANTP 161 4135 GORGAS 161 1	193	90.5	113.0	4157 MILLER8 500 5307 WVERN SS8 500 1	1	P1

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	4234 CLAY 6 230 5039 ARGO DS 230 1	602	97.4	103.9	4157 MILLER8 500 4375 S.BESS 8 500 1	2	P2
SBA	4241 LEEDSTS6 230 5039 ARGO DS 230 1	602	94.2	100.6	4157 MILLER8 500 4375 S.BESS 8 500 1	2	P2

(1) A current operating procedure is sufficient to alleviate this identified constraint without the addition of the proposed transfer. However, the additional transfer exacerbates the loading on this transmission facility such that the operating procedure becomes insufficient.

Scenario Explanations:

1) Gorgas Unit #10 Offline, Shoulder (93% Load Level) Case
2) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case

Table 5.2. Pass 1 – Transmission System Impacts With All Proposed Enhancements – *Southern Balancing Authority*

The following table depicts loadings of transmission facilities in the Southern Balancing Authority ("SBA") that could become potential constraints in future years or with different queuing assumptions, but are not overloaded in the 2019 study year.

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
The following facilities could become potential constraints in future years or with different queuing assumptions							
SBA	199 OOSTANAULA 230 1122 DALTON 6 230 1	664	93.8	99.7	21 MOSTELLER 500 2499 CONASAUGA 500 1	2	--
SBA	9001 MCINTOSH 230 9021 MCINTOSH 115 1	319	96.1	99.3	370401 6OKATIE 230 370402 6JASPER1 230 1	1	--
SBA	8702 DANIEL6 230 8710 MOSSPT E6 230 1	866	95.0	99.2	4642 BIG CK 6 230 8702 DANIEL6 230 1	5	--
SBA	4638 CHICK 6 230 4700 BARRY 6 230 1	833	98.4	98.9	4638 CHICK 6 230 4642 BIG CK 6 230 1	6	--
SBA	4156 MILLER6 230 4172 BOYLESM1 230 1	602	97.8	98.4	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	888 DALTON 115 892 E DALTON B2 115 2	188	97.1	98.2	888 DALTON 115 892 E DALTON B2 115 1	2	--
SBA	888 DALTON 115 892 E DALTON B2 115 1	188	96.6	97.8	888 DALTON 115 892 E DALTON B2 115 2	2	--
SBA	4644 N THEO 6 230 8710 MOSSPT E6 230 1	602	92.8	95.4	4642 BIG CK 6 230 8702 DANIEL6 230 1	6	--
SBA	7311 SHOAL RV3 115 7324 VALPARAI B2 115 1	124	92.6	95.0	7324 VALPARAI B2 115 7325 VALPARAI B1 115 1	5	--
SBA	36 JACK MCD B2 230 41 PEACHTREE 230 1	1192	94.0	95.0	2265 CUMBERLAND 230 2711 JACK MCD B1 230 1	9	--

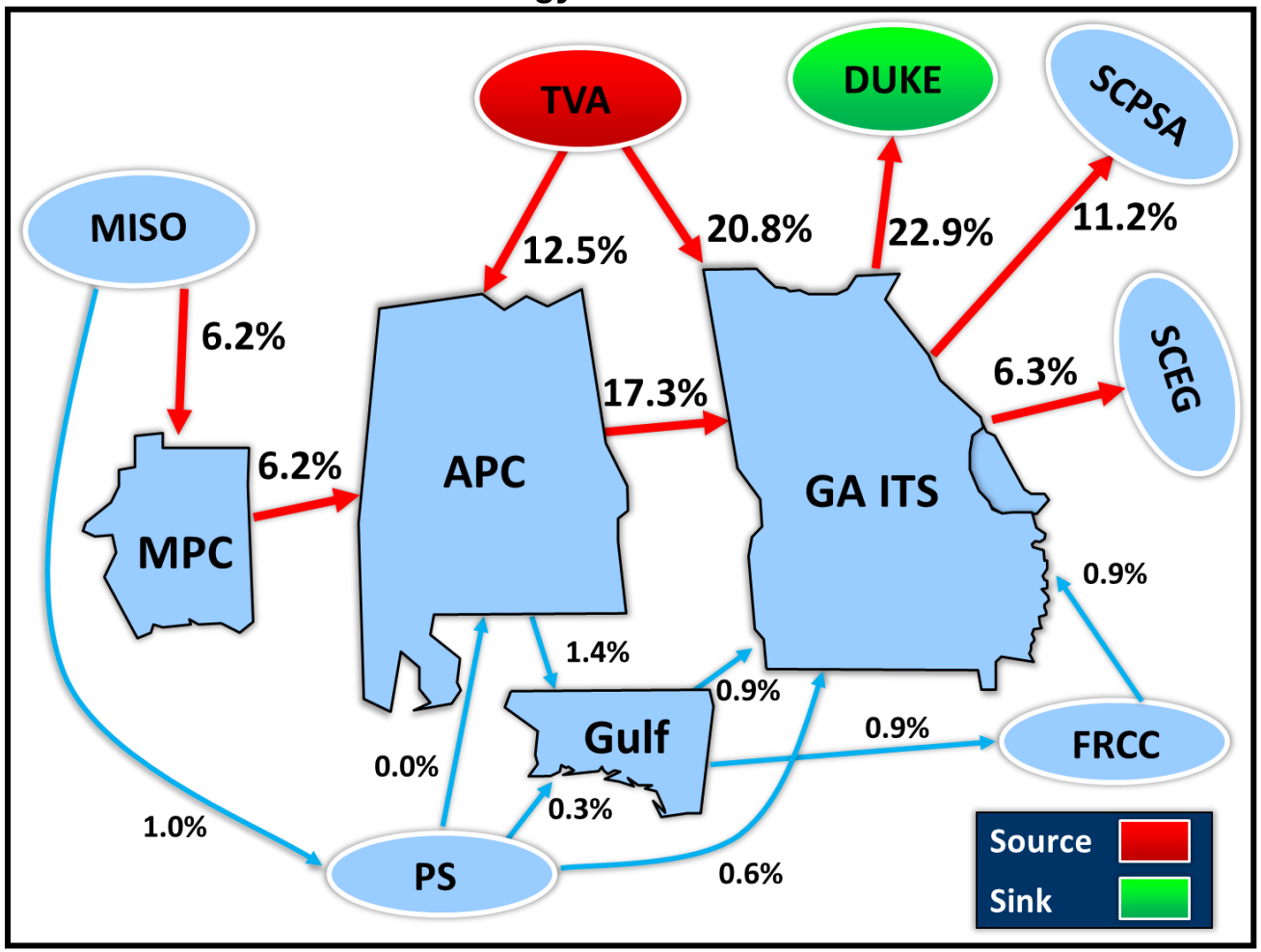
SERTP 2014 Economic Study Results
-Preliminary-
Original: September 19th, 2014 / Revised: October 2nd, 2014

AREA	Limiting Element	Rating (MVA)	Thermal Loadings (%) Without Request	Thermal Loadings (%) With Request	Contingency	Scenario	Project
SBA	8420 NASA 115 8426 LOGTWN W3 115 1	216	92.0	94.3	8400 KILN 6 230 8425 LOGTWN W6 230 1	13	--
SBA	8273 HWY 11 115 8275 HBG CNTY 115 1	138	93.0	94.0	8245 PETAL 115 8252 HATBG NO B2 115 1	6	--
SBA	4126 KING JCT 161 4866 S.VERNTP 161 1	377	87.0	93.9	4157 MILLER8 500 5307 WVERN SS8 500 1	1	--
SBA	718 S COWETA B2 115 876 BROOKS 115 1	155	92.7	93.7	1629 WOOLSEY 230 2771 OHARA B1 230 1	8	--
SBA	4643 BIG CK 3 115 4678 TANERWIL 115 1	107	89.8	93.4	4642 BIG CK 6 230 8702 DANIEL6 230 1	6	--
SBA	4261 ALAMETAL 115 5944 PRATCTY B2 115 1	246	90.8	93.0	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	4260 SO PARK 115 4261 ALAMETAL 115 1	246	90.5	92.8	4157 MILLER8 500 5312 CLAY 8 500 1	7	--
SBA	4660 SPAN FT 115 4661 BELFORST 115 1	212	91.4	92.7	4638 CHICK 6 230 5341 EST SHR TAP 230 1	6	--
SBA	1101 GEORGE DAM 115 1893 FT GAINES 115 1	135	91.2	92.4	715 CEDAR SP J 115 4594 WEBB 3 115 1	5	--
SBA	36 JACK MCD B2 230 41 PEACHTREE 230 1	1192	91.3	92.3	2265 CUMBERLAND 230 2711 JACK MCD B1 230 1	9	--
SBA	611 N COLUMBUS 115 613 FIRST AV B2 115 1	149	90.8	92.0	130 GOAT ROCK 230 609 GOAT ROCK 115 1	11	--
SBA	1135 MCGRAU F B1 230 1931 R_HOPEWL 230 1	509	87.8	92.0	20 BOWEN 500 21 MOSTELLER 500 1	12	--
SBA	4485 FAUNSDAL 115 4744 SONGALTP 115 1	138	89.2	91.6	4471 GREENCO6 230 4489 N SELMA6 230 1	10	--
SBA	208 NELSON 230 954 NELSON 115 2	176	88.5	90.9	208 NELSON 230 954 NELSON 115 1	4	--
SBA	847 BAXLEY 115 1098 BRENTWOOD 115 1	91	88.7	90.8	8 VOGTLE 500 9 W MCINTOSH 500 1	3	--
SBA	25 MCGRAU FORD 500 88 MCGRAU F LS 230 1	2016	85.5	90.5	20 BOWEN 500 21 MOSTELLER 500 1	9	--

Scenario Explanations

1) Gorgas Unit #10 Offline, Summer Peak Case
2) Hammond Offline, Summer Peak Case
3) McIntosh CC Unit #11 Offline, Summer Peak Case
4) Vogtle Unit #1 Offline, Summer Peak Case
5) Smith Unit #3 Offline, Summer Peak Case
6) Crist Offline, Summer Peak Case
7) Gaston Unit #5 Offline, Shoulder (93% Load Level) Case
8) Scherer Unit #1 Offline, Summer Peak Case
9) Bowen Unit #4 Offline, Shoulder (93% Load Level) Case
10) Harris Unit #1 Offline, Shoulder (93% Load Level) Case
11) Hartwell Unit #1 Offline, Shoulder (93% Load Level) Case
12) McDonough Unit #6 Offline, Summer Peak Case
13) Watson Unit #5 Offline, Summer Peak Case

TVA Border to Duke Energy: Transfer Flows within the SERTP



Note: Red arrows indicate transfer percentages of greater than 5%.

Potential Solutions for Identified Constraints

The following projects are potential solutions to address the identified constraints and are based on the assumptions used in this study. It must be noted that changes to the load forecast, and/or changes in the expansion plan could occur, and would impact the results of this study. In addition, the current projected enhancements to the transmission system were modeled in the cases. Changes to system conditions and/or the transmission system expansion plans could also impact the results of this study. These potential solutions only address constraints identified within the SERTP Sponsors' areas that are associated with the proposed transfer. Other Balancing Areas were not monitored which could result in additional limitations and required system improvements.

Table 5.3. Potential Solutions for Identified Constraints – *Southern Balancing Authority*

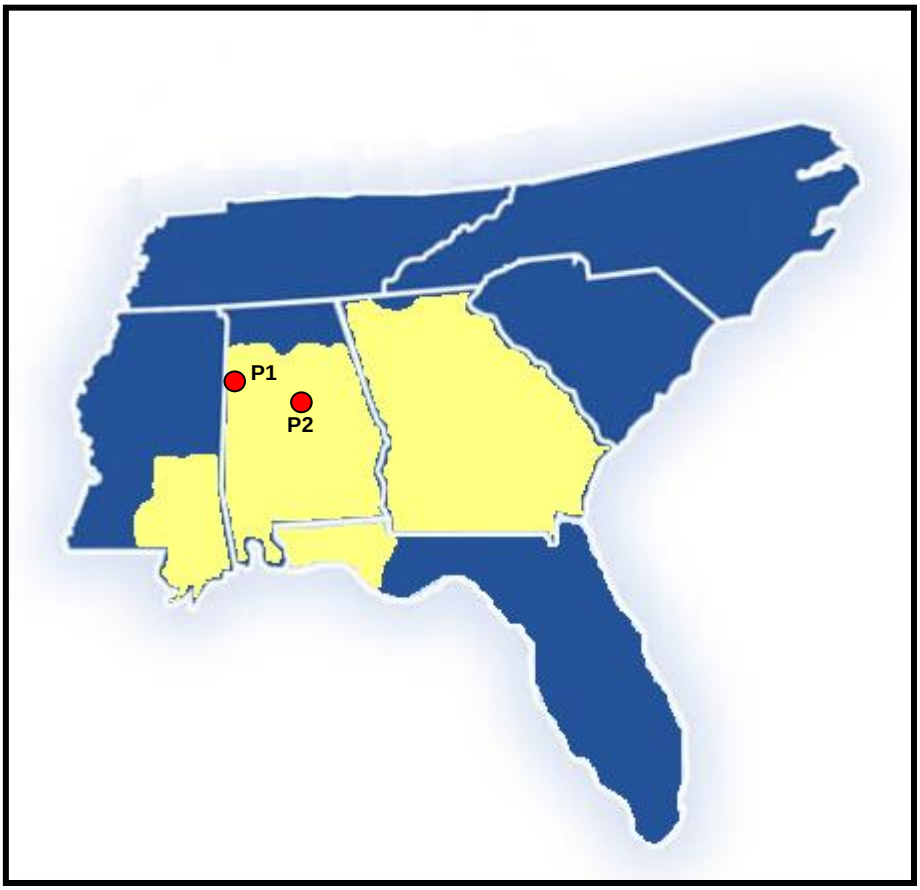
Item	Potential Solution	Estimated Need Date	Estimated Cost
P1	**Fayette – Gorgas 161 kV T.L.** • Rebuild approximately 38.8 miles along the Fayette – Gorgas 161 kV transmission line with 1351 ACSR at 100 °C.	2019	$31,500,000
P2	**Clay TS – Leeds TS 230 kV T.L.** • Reconductor approximately 17.3 miles along the Clay – Leeds 230 kV transmission line with bundled (2) 1351 ACSR at 100 °C.	2019	$22,200,000
SBA Total ($2014)			$53,700,000

Table 5.4. Total Cost of the TVA Border to Duke Energy 1000 MW Transfer

Area	Estimated Cost
SBA Total	$53,700,000
TOTAL ($2014)	**$53,700,000[(1)]**

[(1)] Total cost does not include the cost of projects that are included in SERTP Sponsors' expansion plans and are scheduled to be completed by 6/1/2019. The studied transfer depends on these projects being in-service by 6/1/2019. If any of these projects are delayed or cancelled, the cost to support the study transfer could be greater than the total shown above.

Diagram 5.1. Approximate Location of Potential Solutions



Interchange Assumptions

Table 5.5. Incremental Transactions Preserved to those Modeled in Version 2A Cases

OASIS Ref. #	POR	POD	Amount (MW)
NS1117	DUKE	PS LOAD	50
NS1119	MISO	SMEPA LOAD	140
NS1117	MISO	PS LOAD	150
NL1112	MISO	SOCO	504
147615	DUKE	OPC LOAD	465
147613	TVA	OPC LOAD	310
73509914	GTC	TVA	200
NL1132	TVA	SOCO	500
946923	MISO	GTC	100
NL1132	MISO	SOCO	246
982928	SOCO	DUKE	60

Table 5.6 Capacity Benefit Margin Preserved (CBM)

Transmission Owner	Interface	Amount (MW)
Southern	Duke	350
Southern	TVA	400
Southern	MISO	100
Southern	SCPSA	125
Southern	SCEG	75

Table A.5.7 Transmission Reliability Margins Preserved (TRM)

Transmission Owner	Interface	Amount (MW)
Southern	From Duke	196
GTC	From Duke	106
MEAG	From Duke	25
Dalton	From Duke	3
Southern	From MISO	204
Southern	From TVA	239
GTC	From TVA	52
MEAG	From TVA	12
Dalton	From TVA	2