Northeast Corridor Study Report

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Background

Historically the Bio – Pooles Creek – Avalon Junction 115 kV and Bio – Center Primary 230 kV lines (as shown in Diagram 1) have been overloaded throughout the planning horizon in past interface analyses. These overloads are heavily influenced by the current generation dispatch and transfers being primarily mitigated by splitting the line for the 115 kV overload and through generation redispatch for the 230 kV overload.

Previous studies have been performed for this area, looking at multiple potential projects, and have identified the Middle Fork – Hartwell Energy 230 kV line as the best possible solution for these constraints. The past projects considered include:

- Anthony Shoals – Athena 230 kV Line
- Bio – Middle Fork 230 kV Line
- Rainey – Athena 230 kV Line
- Northern Arc (500 kV Line from McGrau Ford to Middle Fork and 230 kV Line from Palmer Creek to Clermont Junction via S. Dahlonega)
- Hartwell Energy – Athena 230 kV Line
- Hartwell Dam – Middle Fork 230 kV Line
- Vogtle (SOCO) – Barnswell (SC) 230 kV Line
- Wilson (SOCO) – Smoaks (DESC) 230 kV Line



Diagram 1. Constrained Areas in the Northeast Corridor.

Problem Statement

The Northeast Corridor (comprised of the 115 kV and 230 kV lines mentioned above) has historically been constrained for transfers between VACAR and Southern Company due to a combination of contingencies of tie lines and generation in Northeastern Georgia. Current and past studies show this area will continue to be constrained as the load grows rapidly in Atlanta and nearby generation is retired. Issues in this area are largely affected by imports, which include reliability margins. Reliability margins are made up of Capacity Benefit Margins (CBM) and Transmission Reliability Margins (TRM), which are critical to maintaining system reliability in cases of emergency.

Building a new 230 kV transmission line in this area will mitigate these constraints, help maintain the reliable operation of the interconnected power system and increase transfer capability between the Georgia and VACAR.

Potential Solutions Evaluated

- Middle Fork – Hartwell Energy 230 kV line.

Diagram 2 shows a graphical representation of the option evaluated.

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Diagram 2. Potential Tie Line Solution

Area Study Assumptions

Study Parameters

- 2028-2033 Summer Peak and Shoulder scenarios.
- Power flow models use the 2023 series version 2 Base Cases and Interface cases as the starting point.
- Local Area, Export, and Import analyses were performed.
- Two import scenarios evaluated, as outlined below.

Scenario 1 Imports and Gross-up for Transfers with Basecase							
	SOCO	GTC	MEAG	DALTON	TRM	CBM	Total
DESC							
DUKE							
SC							
TVA							

Scenario 2 Imports and Gross-up for Transfers with GTC Reservations							
	SOCO	GTC	MEAG	DALTON	TRM	CBM	Total
DESC							
DUKE							
SC							
TVA							

Sensitivities performed as part of this evaluation on both scenarios

- Potential TP-East 500 kV Project McGrau Ford – Middle Fork.

Study Methodology

- Primary results are based on import analysis as this is worst case for this area with validation for the project done on export and local area screens.
- Expansion generation removed as a part of scenario 2 to account for additional import flow.

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Study Results

The most negative impact on the Northeast Corridor is under an import scenario and thus all results will be reflective of the two import scenarios mentioned above. The projects have been tested in exports and local area to verify no issues have arisen with their addition. The new 230 kV line is very effective at resolving the issues seen but does begin to load up the Hartwell Energy Reactor and eventually overload it in scenario 2. The reactor removal was tested but resulted in higher system loadings with more power being imported into Southern Company. As a result, the replacement of that reactor has also been identified. The results for both scenarios with and without the sensitivity can be found in the following four sections.

Scenario 1 without TP-East Sensitivity

This scenario only saw an overload in 2031, but high loading levels in other years. The project does offer significant improvement to the overloads seen. Table 1 shows the loading summary for Scenario 1 and the detailed results can be found in Appendix A.

Table 1 – Key Facilities import loading for Scenario 1.

Limiting Facility	Years Overloaded	Max Loading	
		Base	Project
Bio – Pooles Creek – Avalon Junction 115 kV	2031	[redacted]	
Bio – Center Primary 230 kV	-		
Hartwell Energy 230 kV Reactors	-		

Scenario 1 with TP-East Sensitivity

The addition of the TP-East sensitivity did help resolve the overload seen and lower the Transfer Distribution Factor (TDF) below the planned 2% cutoff studied in interface studies for the Bio – Pooles Creek – Avalon Junction 115 kV line. This project did not have any notable impact on the Bio – Center Primary 230 kV line or the Hartwell Energy 230 kV reactors. Table 2 shows the loading summary for Scenario 1 with the TP-East Sensitivity and the detailed results can be found in Appendix A.

Table 2 – Key Facilities import loading for Scenario 1 with TP-East sensitivity.

Limiting Facility	Years Overloaded	Max Loading	
		Base	Project
Bio – Center Primary 230 kV	-	[redacted]	
Hartwell Energy 230 kV Reactors	-		

Scenario 2 without TP-East Sensitivity

The additional import flow added in Scenario 2 created significant loadings in the area. The increase on the Northeast Corridor scoped in this report can be seen below. In this scenario, the reactor does overload and will need to be replaced. Table 3 shows the loading summary for Scenario 2 and the detailed results can be found in Appendix A.

Table 3 – Key Facilities import loading for Scenario 2.

Limiting Facility	Years Overloaded	Max Loading	
		Base	Project
Bio – Pooles Creek – Avalon Junction 115 kV	2029 - 2033	[redacted]	
Bio – Center Primary 230 kV	2029 - 2033		
Hartwell Energy 230 kV Reactors	2028 - 2033		

Scenario 2 with TP-East Sensitivity

Similar to Scenario 1, the addition of the TP-East project results in the Bio – Pooles Creek – Avalon Junction 115 kV Line not overloading and falling below the 2% TDF requirement. There is a slight increase in flow on the Hartwell Energy reactors, but no major impacts to the Bio – Center Primary 230 kV Line. Table 4 shows the loading summary for Scenario 2 with the TP-East sensitivity and the detailed results can be found in Appendix A.

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Table 4 – Key Facilities import loading for Scenario 2 with TP-East Sensitivity.

Limiting Facility	Years Overloaded	Max Loading	
		Base	Project
Bio – Center Primary 230 kV	2029 - 2033	[redacted]	
Hartwell Energy 230 kV Reactors	2028 - 2033		

Project Cost and Time Estimates

High level planning budgetary cost estimates were provided by each company for its portion of the project. The summary of the cost and time of construction is estimated in tables below.

Northeast Corridor Recommendations				
Project	**Miles**	**Size**	**Cost ($M)**	**Time (Months)**
Middle Fork – Hartwell Energy 230 kV line	35	Bundled 1351 ACSR	[redacted]	
Hartwell Energy Reactors	N/A	3000 Amp Reactors		
		Total		

Recommendation

Based on the engineering results from this study evaluation, the study team recommends the following projects:

- Construct 35-mile 230 kV line from Middle Fork to Hartwell Energy.
- Replace Hartwell Energy Reactors.

[redacted]

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These projects greatly reduce line loadings in the area, specifically the loadings on the existing Bio – Pooles Creek – Avalon Junction 115 kV Line and the Bio – Center Primary 230 kV Line, enhances operational flexibility, and increases transfer capability between the ITS and VACAR interfaces. The planning-level cost estimate is shown below.

Northeast Corridor Recommendations				
Project	**Miles**	**Size**	**Cost ($M)**	**Time (Months)**
Middle Fork – Hartwell Energy 230 kV line	35	Bundled 1351 ACSR	[redacted]	
Hartwell Energy Reactors	N/A	3000 Amp Reactors		
Total				

Conclusion

The IWG recommends that the Hartwell Energy – Middle Fork 230 kV line project be constructed to relieve the interface constraints identified in the Northeast Corridor as shown in this report document.

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Appendix A - Detailed Study Results

Detailed import loading for Scenario 1

Constraint	Contingency	Source|Sink	UO/AM	Case Type	RF	Variation	2028	2029	2030	2031	2032	2033
Bio – Pooles Creek – Avalon Junction 115 kV Line												
Bio – Center Primary 230 kV Line												
Hartwell Energy 230 kV Reactors												

Detailed import loading for Scenario 1 with TP-East sensitivity

Constraint[1]	Contingency	Source|Sink	UO/AM	Case Type	RF	Variation	2028	2029	2030	2031	2032	2033
Bio – Center Primary 230 kV Line												
Hartwell Energy 230 kV Reactors												

Detailed import loading for Scenario 2

Constraint	Contingency	Source|Sink	UO/AM	Case Type	RF	Variation	2028	2029	2030	2031	2032	2033
Bio – Pooles Creek – Avalon Junction 115 kV Line												
Bio – Center Primary 230 kV Line												
Hartwell Energy 230 kV Reactors												

[1] With the addition of the Sensitivity, the Bio- Pooles Creek – Avalon Junction 115 kV Line falls below the Interface Planning criteria of a 2% TDF, is no longer overloaded, and omitted from the results.

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Detailed import loading for Scenario 2 with TP-East sensitivity

Constraint[2]	Contingency	Source|Sink	UO/AM	Case Type	RF	Variation	2028	2029	2030	2031	2032	2033
Bio – Center Primary 230 kV Line												
Hartwell Energy 230 kV Reactors												

[2] With the addition of the Sensitivity, the Bio- Pooles Creek – Avalon Junction 115 kV Line falls below the Interface Planning criteria of a 2% TDF, is no longer overloaded, and omitted from the results.