Goshen Area Working Group Report

TPWG

November 2024

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Background

The ITS conducted the 2024 v1C screen study to evaluate thermal and voltage constraints across the state of Georgia. Starting in 2026, thermal constraints were identified on the Augusta Corporate Park - Vogtle 230 kV transmission line attributable to proximity to nuclear generation at plant Vogtle and projected area load growth. In addition, the Goshen – Vogtle 230 kV, Augusta Corporate Park - Vogtle 230 kV, and Augusta Newsprint - Vogtle Switching 230 kV lines share a common corridor, and current operational limitations due to system capacity restrict the ability of service interruptions for facility upgrades. The Goshen Area Study Working Group was established at TPWG to identify appropriate mitigation efforts.

Problem Statement

- **Loss of the REDACTED REDACTED line results in thermal constraints on the following transmission line:**
  - Augusta Corporate Park - Vogtle 230 kV line.
    - Years: 2026, 2030 – 2032
    - Thermal constraints occur primarily during Daylight Shoulder load levels.
    - Thermal constraints occur primarily during the Vogtle/Wilson Area Max Dispatch.
- **Multiple N-1-1 contingencies in the Goshen area result in thermal constraints on the following transmission lines:**
  - Augusta Corporate Park - Vogtle 230 kV Line.
  - Augusta Newsprint – Vogtle Switching Station 230 kV Line
  - Goshen – Vogtle 230 kV Line

Recommendation

Goshen – (New) Waynesboro Area Switching Station 230 kV Line (REDACTED)

- Construct a new 230 kV three element ring bus that will be looped into the Waynesboro Primary – Wilson 230 kV line. (**REDACTED**)*
- Construct an ~12-mile 230 kV line (200°C 1351 ACSS conductor or similar) from the Goshen 230/115 kV SS to the new 230 kV Switching Station. (**REDACTED**)*
- Loop in the Waynesboro Primary – Wilson 230 kV line into the new 230 kV Switching Station. (**REDACTED**)
- Terminate the Goshen – New 230 kV SS line into Goshen. Install new 230 kV, 3000A breaker and associated termination/relaying equipment at Goshen for new line termination. (**REDACTED**)

With area problem statements beginning as early as 2026, it will be necessary to utilize the following operating guide to alleviate thermal constraints until recommended corrective action plan is implemented.

- Open **REDACTED REDACTED.**

*Estimate uses a 230 kV line cost assumption of **REDACTED** per mile for overhead construction and a 230 kV switching station cost assumption of **REDACTED**

The recommended plan effectively alleviates the thermal loading limitations in a cost-effective manner. Thermal constraints driven by N-1-1 contingencies were either alleviated or reduced by approximately **REDACTED** (see Appendix A). This alternative creates an additional parallel path to the area to support added operational flexibility and to maintain system integrity and resiliency. Construction of a new line to mitigate the identified problem statements is also preferable in that it minimizes the number of construction-related outages to existing facilities during implementation. The assumed route utilizes existing ROW and avoids any operational issues that would be present during other alternatives specifically regarding the termination/routing in close proximity to the highly congested Vogtle area. This is not the least cost alternative but is only marginally (**REDACTED)** more than the low-cost option. The added capacity to the system and lack of impact to existing facilities warrant pursuing this option at the marginally higher cost.



Other Alternatives Considered

Do Nothing (REDACTED):
This alternative is not an acceptable course of action due to the identified system deficiencies. Not pursuing mitigation would result in thermal overloads on the system under single contingency events which would ultimately lead to significant service limitations and potential loss of load in the area.

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Brute Force (REDACTED):

- Rebuild the Augusta Corporate Park – Vogtle 230 kV line with 14.2 miles of minimum (2) 100C 1351 ACSR conductor. (**REDACTED**)*

The cost of this alternative is **REDACTED** less than that of the proposed 12-mile 230 kV line from Goshen to the new 230 kV Switching Station and is the least cost option considered. However, the transmission outages required to accomplish this plan would create operational limitations and degraded reliability during construction. Additionally, this alternative does not effectively increase area available capacity when compared to the recommendation. This alternative was discounted given the minimal available capacity of the area and line outage constraints faced along this 230 kV corridor in close proximity to Vogtle.

Figure 2: Augusta Corporate Park – Vogtle 230 kV Rebuild Map



*Estimate uses a 230 kV line rebuild assumption of **REDACTED** per mile.

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Goshen – New 500/230 kV SS 230 kV Line (REDACTED)

- Construct a 500/230 kV substation on the Thomson – Vogtle 500 kV line, consisting of a three-element 500 kV ring bus with a 2016 MVA autotransformer and three-rung 230 kV breaker and a half configuration. To be located approximately 15.5 miles away from Vogtle 500 kV. (**REDACTED**)*
- Loop in the Thomson Primary – Vogtle 500 kV line to the proposed 500/230 kV substation. (**REDACTED**)
- Loop in the Waynesboro Primary – Wilson 230kV line to the proposed 500/230 kV substation. (**REDACTED**)
- Construct a new approximately 12-mile 230 kV line from the new 500/230 kV substation to Goshen 230 kV with 200C 1351 ACSS conductor. (**REDACTED**)*
- Install new 230 kV, 3000A breaker and lines switches, jumpers, and pilot relaying with associated equipment at Goshen for new line termination. (**REDACTED**)

Figure 3: New 500/230 kV Substation Map



This alternaEve is less cost and Eme efficient/effecEve than the proposed recommendaEon and was therefore discounted. Available capacity increases and N-1/N-1-1 constraint alleviaEon are similar for both this alternaEve and the recommendaEon. AddiEonally, the recommended plan could accommodate a future 500 kV connecEon if increasing generation or large load addiEons drive a need for an addiEonal 500/230 kV source.

*Estimate uses a 230 kV line cost assumption of **REDACTED** per mile for overhead construction and a 500/230 kV substation cost assumption of **REDACTED**.

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Goshen – Vogtle 230 kV (White) Line (REDACTED)

- Construct a new approximately 22-mile line from Goshen to Vogtle with (2) 200C 1351 ACSS conductor on a new ROW. (**REDACTED**)*
- Install new 230 kV, 3000A breaker and lines switches, jumpers, and pilot relaying with associated equipment at Goshen for new line termination. (**REDACTED**)
- Install two new 230 kV, 3000A breaker and lines switches, jumpers, and pilot relaying with associated equipment at Vogtle for new line termination. (**REDACTED**)



This alternaEve is less cost and Eme efficient than the proposed recommendaEon and was therefore discounted. Available capacity increases are marginally greater under this alternaEve compared to the recommendaEon, however, operaEonal issues regarding the termination/routing in close proximity to the highly congested Vogtle area could present construction constraints and therefore may not be a viable option in resolving the problem statements in a time effective manner. AddiEonally, this line would be constructed along a new route to avoid exisEng common corridor/common tower constraints. Greenfield construcEon would present increased cost and potenEal Eming constraints compared to the recommendaEon which uElizes exisEng ROW.

*Estimate uses a 230 kV line cost assumption of **REDACTED** per mile for overhead construction.

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Area Study Assumptions

Study Parameters	
Year(s):	2025 through 2034
Load levels:	Summer Peak, Hot Weather, Shoulder, Daylight Shoulder, and Off-Peak Southern Balancing Authority Area (SBAA) Power Flow Models
Base case origination:	2024 version 1C Series
Generation dispatch:	• **REDACTED** • **REDACTED**
Monitored Areas:	GA-ITS Zones 214, 215, 218. 219; 115 kV and above
Contingencies:	N-1 Contingencies GA-ITS Zones 214, 215, 218, 219; 115 kV and above.

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N-1-1 Contingencies Off Peak – Appropriate combinations based on the scenarios below:

- **REDACTED**
- **REDACTED**
- **REDACTED**
- **REDACTED**
- **REDACTED**
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- **REDACTED**
- **REDACTED**

Study Criteria

1. Transmission line and transformer bank loadings are not to exceed normal rating (Rate A) under non-contingency conditions.
2. Transmission line and transformer bank loadings are not to exceed normal rating (Rate B) under single contingency conditions.
3. Voltages on 115 kV and 230 kV buses are to be maintained within normal (95-105%) limits under non-contingency conditions.
4. Voltages on 115 kV and 230 kV buses are to be maintained within normal (92-105%) limits under single contingency conditions.
5. Voltages on 115 kV and 230 kV buses are to be maintained within normal (90-105%) limits under multiple contingency conditions.
6. Voltage deviation is defined as the voltage difference between pre-contingency/pre-fault and post-contingency/post-fault voltages. In the steady state, post-contingency voltage deviations must not result in bus voltages outside the Acceptable Voltage Range listed in Table 5.1A. When capacitor banks are manually switched in or out, the step change in voltage should be no greater than +/- 2.5% under N-0 conditions, and no greater than +/- 6% under Contingency. Voltage deviations in transient conditions represent impacts to System stability and/or power quality. Power quality limits are documented in ITS Operating Procedure 26 (ITS Voltage Fluctuation Guideline).
7. Voltages on 500 kV buses are to be maintained within normal (97-107.5%) limits under single contingency conditions.
8. Future planned projects are included in the cases.

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Study Methodology

- Analysis was performed in accordance with the planning events and system performance criteria in TPL-001-5.1 Table 1.
- Normal and contingency conditions were examined for each case with the generation dispatch unchanged from the base cases.
- Unit out/alternate dispatch analysis was performed for the critical generating units in or near the study region. The criteria for selection of unit out scenarios is as follows:

  - Geographical area. When outages of different units impact the same facilities or geographical area, the units with the most significant negative impact are fully evaluated. Units are selected to provide diversity across the area of study.
  - Amount of potential generation lost. All units at a multi-unit plant are excluded except for the largest unit at each voltage level.
  - Previously identified system constraints.
  - Critical units identified in System Operating Study for the current year

  The list of the units, voltage levels, and power outputs is detailed in preceding *Study Parameters* table. For each unit taken out of service, GA-ITS and/or other SBAA generation was economically re-dispatched to account for lost generation.

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Appendix A

Figure 4: Goshen Area N-1 Loading Table

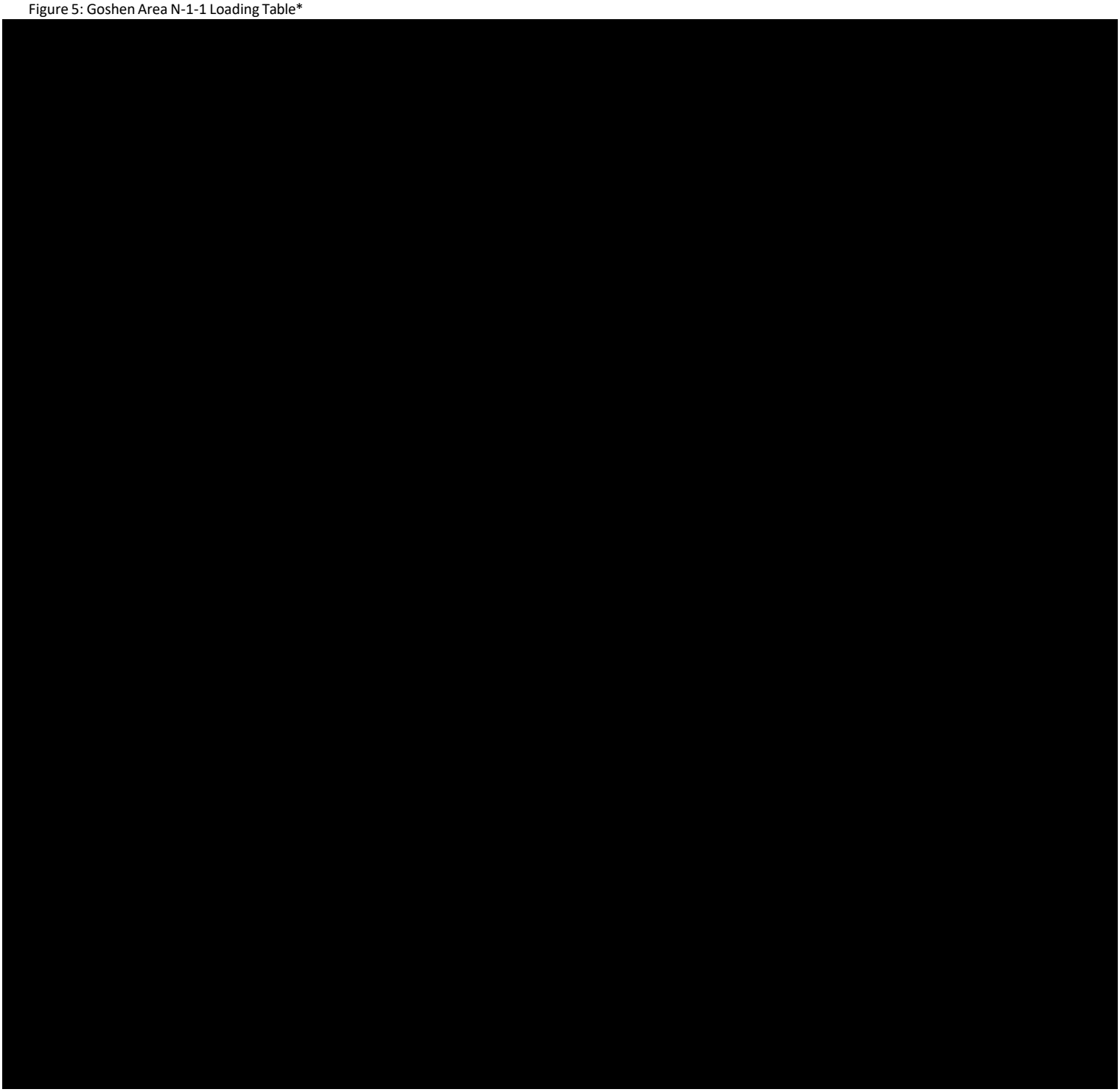


V1C: No Corrective Action
Alt 1: Goshen – New 230 KV Switching Station
Alt 2: New 500/230 kV Substation
Alt 3: Goshen – Vogtle 230 kV (White)

*60% Loading Cutoff in results provided.

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Figure 5: Goshen Area N-1-1 Loading Table*



V1C: No Corrective Action
Alt1: Goshen – New 230 KV Switching Station
Alt2: New 500/230 kV Substation
Alt 3: Goshen – Vogtle 230 kV (White)

*95% Loading Cutoff in results provided.

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Figure 6: Goshen Area Available Capacity Table

