

Gilchrist 1-7 Simple Cycle & Combined Cycle Units

Feasibility Report

Generation Description

- Gilchrist plant will be owned and operated by Redacted
- 3 simple cycle CTs and a 3-on-1 combined cycle system
- PEF GI Queue #88 & #90
- CT in-service date of 12/1/2015
- CC in-service date of 5/1/2016
- Summer peak = $(153*6 + 322) = 1,240$ MW
- Winter peak = $(182*6 + 322) = 1,414$ MW

Interconnection Points Evaluated

Point(s) of interconnection requested for study by interconnection customer:

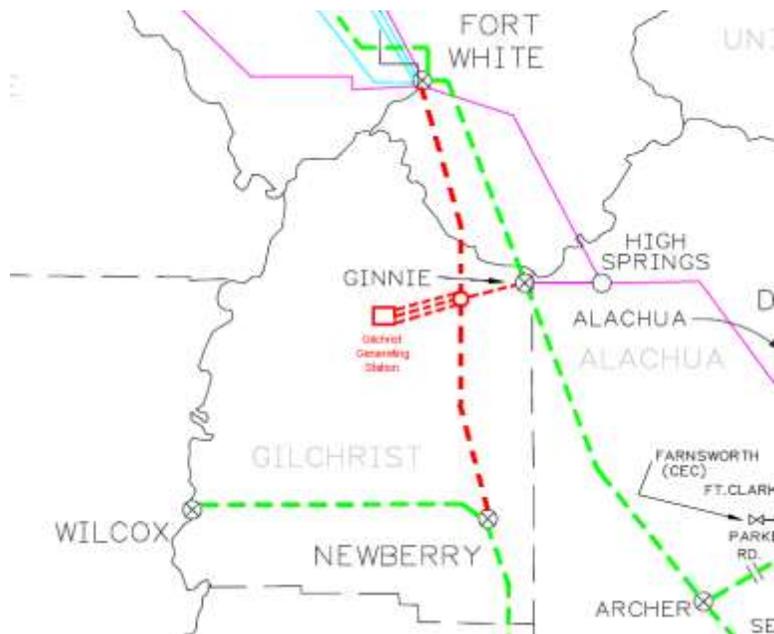
- Option A
 - Connection to PEF's Ginnie substation, 3 230kV transmission lines, 10.5 miles
 - Rebuild Ft. White-Ginnie line, 11.8 miles
 - Rebuild Ginnie-Haile line, 11.0 miles
 - Rebuild Haile-Archer line, 9.8 miles
- Option B
 - Connection to PEF's Fort White-Newberry line, 3 230kV transmission lines, 8 miles
 - Build new transmission line from interconnection point on Fort White-Newberry line to Ginnie substation, 2.5 miles
 - Rebuild Ft. White- Newberry line, 23.2 miles
- Option C
 - Connection to PEF's Fort White-Ginnie-Archer line, 3 230kV transmission lines, 10.5 miles
 - Rebuild Ft. White-Ginnie line, 11.8 miles
 - Rebuild Ginnie-Haile line, 11.0 miles
 - Rebuild Haile-Archer line, 9.8 miles
- Option D
 - Connection to PEF's Fort White substation, 3 230kV transmission lines, 20 miles

Alternative point(s) of interconnection considered by PEF:

- Option E
 - Connection to PEF's Ginnie substation, 3 230kV transmission lines, 10.5 miles
 - Ft. White-Newberry line rerouted through Ginnie substation, 2.5 miles
- Option F
 - Connection to PEF's Fort White-Newberry line, 3 230kV transmission lines, 8 miles
 - Build new transmission line from Newberry substation to Haile switching station, 8.4 miles
 - Rebuild Ft. White-Newberry, 23.2 miles
 - Build additional circuit from interconnection point on Ft. White-Newberry line to Newberry substation, 10.3 miles
- Option G
 - Connection to PEF's Fort White substation, 1 230kV transmission line, 20 miles
 - Connection to PEF's Ginnie substation, 10.5 miles
 - Connection to PEF's Wilcox substation, 20 miles

- Option H
 - Construct a 500 kV transmission line from Archer substation to Ginnie substation, 20.8 miles.
 - Construct a 500 kV transmission line from Ginnie substation to Gilchrist substation, 10.5 miles.
 - Construct a 500 kV transmission line from Gilchrist substation to Ft. White substation, 18.8 miles.
 - Install 500/230 kV autos at Archer, Ginnie, and Ft. White.
- Option I
 - Construct a 500 kV transmission line from Central Florida substation to Archer substation, 68 miles.
 - Construct a 500 kV transmission line from Archer substation to Ginnie substation, 20.8 miles.
 - Construct a 500 kV transmission line from Ginnie substation to Gilchrist substation, 10.5 miles.
 - Construct a 500 kV transmission line from Gilchrist substation to Ft. White substation, 18.8 miles.
 - Install 500/230 kV autos at Archer, Ginnie, and Ft. White.

Option B Diagram



Models

All models were based on the FRCC 2008 series revision 4 cases with TECO corrections applied. The model years studied for power flow analyses were 2015 winter, 2016 summer including Levy units 1 & 2 and their associated transmission service requests, 2016/17 winter including Levy units 1 & 2 and their associated transmission service requests. The 2016 summer and 2016/17 winter FRCC base cases included reasonably expected transmission enhancements for supporting the interconnection of Levy units 1 & 2.

The models that included the Gilchrist interconnection options (“option cases”) utilized the base cases with the addition of Gilchrist generators 1-7, the simple cycle and the combined cycle units, and associated transmission for each interconnection option under consideration. Sensitivity analysis was performed to determine the impact of the Gilchrist generators in addition to the proposed Suwannee generators for options B, E, and I.

Generator Interconnection Queue

Prior queued generation in the FRCC coordinated queue was reviewed, and the queued generation requests deemed relevant to this study are:

- Seminole Generating Station Unit 3 (remove from 2015/16W case per information from SECI)
- Levy Plants 1 & 2 (Levy unit 1 already modeled in 2016S, 2016/17W cases, add unit 2)
- Suwannee Plant CTG A, CTG B, CTG C, CTG D, and STG (already modeled in all cases, model as necessary)

All other generation in the queue was considered to be electrically remote from the Gilchrist site or sufficiently small as to not affect the results of this study.

Redacted informed PEF that Seminole unit 3 should only be removed from cases that have the Gilchrist combined cycle units (Gilchrist units 4-7) in service. Since this phase of the Gilchrist feasibility study is examining the effects of the interconnection of the Gilchrist simple cycle and combined cycle units, Seminole Unit 3 was removed from the study base cases.

This feasibility study included Levy units 1 & 2 in the 2016 summer case and the 2016/17 winter case even though the queued commercial operation date of Levy unit 2 is not until 6/1/2018. The purpose for including Levy unit 2 in these models beginning in 2016 summer was that all transmission enhancements associated with Levy units 1 & 2 will be in service by the commercial operation date of Levy unit 1 in 2016 summer. This will allow for assessment of how the Gilchrist plant interconnection will affect the transmission system in the presence of the prior queued Levy units. The timing of transmission enhancements that are required as a result of Levy unit 2 and the Gilchrist plant being in service simultaneously that would not be necessary until Levy unit 2 comes online will be determined as part of the Gilchrist Plant system impact study.

The Suwannee Combined Cycle Plant (CTG A, CTG B, CTG C, CTG D, and STG) is currently undergoing transmission studies (Feasibility and System Impact) in accordance with its queue positions to determine the required transmission upgrades needed to accommodate the interconnection. Once the required transmission upgrades are identified for the prior queued Suwannee Plant Combined Cycle interconnection, this Gilchrist SC and CC generator interconnection request will be restudied to clearly identify the transmission upgrades needed.

For these above stated reasons, and with concurrence from the requesting customer, this initial Gilchrist SC and CC study did not include in the base-case the prior queued Suwannee Plant Combined Cycle Interconnection resource and associated transmission upgrades. However, as part of this Gilchrist SC and CC Interconnection Feasibility study, a sensitivity analysis was performed that includes the prior queued Suwannee Plant Combined Cycle Interconnection resource to provide the customer with information regarding possible transmission upgrades that may be attributable to the Gilchrist SC and CC Interconnection request.

Transmission Service Request Priority List Issues

A review of transmission service requests in the FRCC coordinated priority list was performed, and it was determined that the only TSRs in the time frame of the model years under study that could have an impact on the study results were transactions associated with the Levy units. These transactions were included in the 2016 cases.

Short Circuit Case Setup

Short circuit analysis was performed using the FRCC 2008 series 2014 final corrected model. A review of the FRCC coordinated generator interconnection queue was performed to determine if additional generation needed to be added to the models. Levy units 1 & 2 were added to the base model with their associated transmission enhancements. Suwannee proposed generation was removed from the base model, and the original (existing) Suwannee plant was restored to the model. Gilchrist generation was removed from the base model.

Analyses performed

ACCC power flow analysis of base case and transfer cases was performed to determine the impact of interconnecting the Gilchrist generation on the transmission system in the area. The base case and each of the interconnection option cases were compared to determine if the interconnection option created thermal overloads or voltage violations, or exacerbated existing thermal overloads or voltage violations. All single element contingencies in the Progress Energy Florida (PEF area 2), Gainesville Regional Utilities (GVL area 4), and Seminole Electric Cooperative, Inc. (SECI area 12) areas were run in ACCC. All single element contingencies in the Florida Power and Light Company northern area (FPL area1, zone 5) with operating voltages greater than 100 kV were run in ACCC. The entire FRCC footprint (areas 1-17, and 19) was monitored for thermal and voltage violations.

Short Circuit analysis was performed using PSS/E activity ASCC. Three phase and single line-to-ground faults were applied at all buses within 6 buses of Ft. White north bus, Ft. White south bus, and the Newberry bus. Fault analysis was performed with a flat start and all generation in the region in service. Code 30 generation was excluded except for the Levy units.

ACCC Screening Criteria

The following screening criteria were used for screening ACCC thermal results:

- GSU transformers were excluded from consideration.
- System-intact overloads must be greater than 100 percent of rate A.
- Post-contingency overloads must be greater than 100 percent of rate B.
- Post-contingency overloads that are improved by the interconnection were excluded.
- In the option cases, the post-contingency overloads must have been made worse than the base case by 3% or greater.

The following screening criteria were used for screening ACCC voltage results:

- Buses in PEF and SECI were monitored for values outside of the range 0.9 – 1.05 p.u.
- Buses in FPL were monitored for values outside the range 0.95-1.06 p.u.
- All other monitored areas were monitored for values outside of the range 0.95 – 1.05 p.u.
- Crystal River Plant (3522) bus voltage, 230 kV bus voltage must remain above 232.4kV, or 1.0104 p.u.
- Generator buses and buses with nominal voltage below 69 kV were excluded from consideration.
- Absolute change in post-contingency bus voltage between base case and the option cases must be greater than 0.005 p.u.

ASCC Screening Criteria

The following screening criteria were used for screening the ASCC short circuit results:

- Three phase and single line-to-ground fault current had to increase by 3% over the base case fault current.
- Breaker interrupting capabilities were reviewed at buses that increased by 3% or more.

Study Results for Option A

Option A has been excluded from the viable options. The PSS/E power flow solution algorithm could not solve for this interconnection configuration.

Study Results for Option B

Required Upgrades

Thermal:

Option B will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ft. White substation to Newberry substation 230 kV transmission line, 8 miles each.
- Rebuild the Ft. White-Gilchrist interconnection-Newberry 230 kV transmission line, 23.2 miles.
- Build a new 230 kV line from the interconnection point on the Ft. White-Newberry line to Ginnie substation, 2.5 miles.
- Replace the Ft. White 115/69 kV transformer.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit 1, 9.8 miles.
- Rebuild Madison substation to Madison tap 115 kV circuit, 0.4 miles.
- Rebuild Ft. White tap to High Springs substation 69 kV circuit, 8.1 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.
- Rebuild 69 kV bus at Ft. White with higher rated equipment.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option B. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

Costs:

The planning estimate for option B is \$185.5 million.

Option B, Suwannee Generation Sensitivity

Required Upgrades

Thermal:

Option B will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ft. White substation to Newberry substation 230 kV transmission line, 8 miles each.
- Rebuild the Ft. White-Gilchrist interconnection-Newberry 230 kV transmission line, 23.2 miles.
- Build a new 230 kV transmission line from the interconnection point on the Ft. White-Newberry line to Ginnie substation, 2.5 miles.
- Build a second new 230 kV transmission line from the interconnection point on the Ft. White-Newberry line to Ginnie substation, 2.5 miles.
- Replace Newberry substation 230/69 kV transformer
- Replace Wilcox substation 230/69 kV transformer
- Rebuild Ft. White S bus to Ginnie substation 230 kV circuit, 11.8 miles.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit, 9.8 miles.
- Rebuild Archer substation to Martin W substation 230 kV circuit, 26.9 miles.
- Rebuild Newberry substation to Bronson substation 230 kV circuit, 12.5 miles.
- Rebuild Perpetual Energy substation to Hanson substation 115 kV circuit, 1.6 miles.
- Rebuild Perpetual Energy substation to Madison tap 115 kV circuit, 1.7 miles.
- Rebuild Drifton substation to Aucilla tap 115 kV circuit, 5.2 miles.
- Rebuild Aucilla tap to Greenville switching station 115 kV circuit, 8.6 miles.
- Rebuild Jasper substation to Tarver 115 kV circuit, 13.4 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Drifton substation to Eridu tap 69 kV circuit, 13.5 miles.
- Rebuild Idylwild substation to Wacahoota tap 69 kV circuit, 10.1 miles.
- Rebuild Lebanon substation to Otter Creek tap 69 kV circuit, 15.0 miles.
- Rebuild Lebanon substation to Levy N tap 69 kV circuit, 6.2 miles.
- Rebuild Zephyrhills N substation to Zephyrhills substation 69 kV circuit, 4.1 miles.

Voltage:

One voltage violation on the PEF transmission system was identified at the Crystal River Plant 230 kV bus in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

Short Circuit:

Short circuit analyses were not performed for sensitivities.

Third Party Impact:

Two possible third party voltage violations were identified, one on the FPL transmission system in the 2016 winter case and one on the GVL transmission system in the 2016 winter case, that were attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

Two possible third party thermal violations were identified on the GVL transmission system in the 2016 winter case that were attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option B.

Study Results for Option C

Option C has been excluded from the viable options. The PSS/E power flow solution algorithm could not solve for this interconnection configuration.

Study Results for Option D

Required Upgrades

Thermal:

Option D will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ft. White substation, 20 miles each.
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Ft. White South bus to Ginnie substation 230 kV circuit 1, 11.8 miles.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit 1, 9.8 miles.
- Rebuild Madison substation to Madison tap 115 kV circuit, 0.4 miles.
- Rebuild Ft. White B bus to Ft. White tap 69 kV circuit, 6.4 miles.
- Rebuild Ft. White tap to High Springs substation 69 kV circuit, 8.1 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.
- Rebuild 69 kV bus at Ft. White with higher rated equipment.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option D.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option D. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option D.

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option D.

Costs:

The planning estimate for option D is \$235 million.

Study Results for Option E

Required Upgrades

Thermal:

Option E will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ginnie, 10.5 miles.
- Split the Ft. White substation to Newberry substation 230 kV circuit at 10.3 miles north of Newberry substation. From this split, build two new 230 kV transmission lines to Ginnie Substation, 2.5 miles.
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit 1, 9.8 miles.
- Rebuild Madison substation to Madison tap 115 kV circuit, 0.4 miles.
- Rebuild Ft. White tap to High Springs substation 69 kV circuit, 8.1 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.
- Rebuild 69 kV bus at Ft. White with higher rated equipment.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option E. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

Costs:

The planning estimate for option E is \$158.5 million.

Option E, Suwannee Generation Sensitivity

Required Upgrades

Thermal:

Option E will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ginnie, 10.5 miles.
- Split the Ft. White substation to Newberry substation 230 kV circuit at 10.3 miles north of Newberry substation. From this split, build two new 230 kV transmission lines to Ginnie Substation, 2.5 miles.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit, 9.8 miles.
- Rebuild Archer substation to Martin W substation 230 kV circuit, 26.9 miles.
- Rebuild existing section of Ft. White substation to Newberry substation 230 kV circuit south of the point where it is routed through Ginnie substation, 10.3 miles.
- Rebuild Perpetual Energy substation to Hanson substation 115 kV circuit, 1.6 miles.
- Rebuild Perpetual Energy substation to Madison tap 115 kV circuit, 1.7 miles.
- Rebuild Drifton substation to Aucilla tap 115 kV circuit, 5.2 miles.
- Rebuild Aucilla tap to Greenville switching station 115 kV circuit, 8.6 miles.
- Rebuild Jasper substation to Tarver 115 kV circuit, 13.4 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Drifton substation to Eridu tap 69 kV circuit, 13.5 miles.
- Rebuild Idylwild substation to Wacahoota tap 69 kV circuit, 10.1 miles.
- Rebuild Lebanon substation to Otter Creek tap 69 kV circuit, 15.0 miles.
- Rebuild Zephyrhills N substation to Zephyrhills substation 69 kV circuit, 4.1 miles.

Voltage:

One voltage violation on the PEF transmission system was identified at the Crystal River Plant 230 kV bus in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

Short Circuit:

Short circuit analysis was not performed for sensitivities.

Third Party Impact:

Three possible third party voltage violations were identified, two on the FPL transmission system in the 2016 winter case and one on the GVL transmission system in the 2016 winter case, that were attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

Two possible third party thermal violations were identified on the GVL transmission system in the 2016 winter case that were attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option E.

Study Results for Option F

Required Upgrades

Thermal:

Option F will require the following upgrades to the transmission system:

- Build 3 new 230 kV transmission lines from Gilchrist substation to PEF's Ft. White substation to Newberry substation 230 kV transmission line, 8 miles each.
- Rebuild the Ft. White-Gilchrist interconnection-Newberry 230 kV transmission line, 23.2 miles.
- Build a new 230 kV transmission line from Newberry substation to Haile switching station, 8.4 miles.
- Build a second 230 kV transmission line from the interconnection point to Newberry substation, 10.3 miles.
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Haile switching station to Archer substation 230 kV circuit 1, 9.8 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option F.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option F. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option F.

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option F.

Costs:

The planning estimate for option F is \$241.9 million.

Study Results for Option G

Required Upgrades

Thermal:

Option G will require the following upgrades to the transmission system:

- Build a new 230 kV transmission line from Gilchrist substation to PEF's Ft. White substation, 20 miles.
- Build a new 230 kV transmission line from Gilchrist substation to PEF's Ginnie substation, 10.5 miles.
- Build a new 230 kV transmission line from Gilchrist substation to PEF's Wilcox substation, 20 miles.
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit, 9.8 miles.
- Rebuild Madison substation to Madison tap 115 kV circuit, 0.4 miles.
- Rebuild Ft. White tap to High Springs substation 69 kV circuit, 8.1 miles.
- Rebuild Ginnie substation to High Springs substation 69 kV circuit, 4.3 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.
- Rebuild 69 kV bus at Ft. White with higher rated equipment.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option G.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option G. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option G.

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option G.

Costs:

The planning estimate for option G is \$181.7 million.

Study Results for Option H

Required Upgrades

Thermal:

Option H will require the following upgrades to the transmission system:

- Construct a 500 kV transmission line from Archer substation to Ginnie substation, 20.8 miles.
- Construct a 500 kV transmission line from Ginnie substation to Gilchrist substation, 10.5 miles.
- Construct a 500 kV transmission line from Gilchrist substation to Ft. White substation, 18.8 miles.
- Install 500/230 kV transformers at Archer, Ginnie, and Ft. White (2 transformers).
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Ft. White South bus to Ginnie substation 230 kV circuit 1, 11.8 miles.
- Rebuild Boyd tap to Perry N tap 69 kV circuit, 3.3 miles.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option H.

Short Circuit:

Short circuit analyses showed that no PEF buses were impacted by the interconnection of the Gilchrist generation using option H. This does not preclude the possibility of third party impacts as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party voltage violation was identified on the FPL transmission system in the 2015 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option H.

Three possible third party thermal violations were identified, one on the FPL transmission system in the 2016 winter case and two on the GVL transmission system in the 2016 winter case, that were attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option H.

Costs:

The planning estimate for option H is \$309.8 million.

Study Results for Option I

Required Upgrades

Thermal:

Option I will require the following upgrades to the transmission system:

- Construct a 500 kV transmission line from Central Florida substation to Archer substation, 68 miles.
- Construct a 500 kV transmission line from Archer substation to Ginnie substation, 20.8 miles
- Construct a 500 kV transmission line from Ginnie substation to Gilchrist substation, 10.5 miles.
- Construct a 500 kV transmission line from Gilchrist substation to Ft. White substation, 18.8 miles.
- Install 500/230 kV transformers at Archer, Ginnie, and Ft. White (2 transformers).
- Replace the Ft. White substation 115/69 kV transformer.
- Rebuild Ft. White South bus to Ginnie substation 230 kV circuit, 11.8 miles.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option I.

Short Circuit:

Short circuit analyses for option I showed that several 230 kV breakers at PEF's Central Florida substation will experience increases in fault current that are greater than 3% and will cause those breakers to exceed their fault current interrupting capability. In addition, 230 kV breakers at PEF's proposed Central Florida South substation may have to have breakers specified with fault current interrupting capability higher than PEF's standard specification for 230 kV breakers.

Third party impacts are also still a possibility, as third party breaker fault interrupting capabilities were not available. Further analyses will be required to identify third party impacts.

Third Party Impact:

One possible third party thermal violation was identified on the FPL transmission system in the 2016 winter case that was attributable to the interconnection of the Gilchrist simple cycle and combined cycle units using option I.

Costs:

The planning estimate for option I is \$573.4 million.

Option I, Suwannee Generation Sensitivity

Required Upgrades

Thermal:

Option I will require the following upgrades to the transmission system:

- Construct a 500 kV transmission line from Central Florida substation to Archer substation, 68 miles.
- Construct a 500 kV transmission line from Archer substation to Ginnie substation, 20.8 miles
- Construct a 500 kV transmission line from Ginnie substation to Gilchrist substation, 10.5 miles.
- Construct a 500 kV transmission line from Gilchrist substation to Ft. White substation, 18.8 miles.
- Install 500/230 kV transformers at Archer, Ginnie, and Ft. White (2 transformers).
- Replace the Clermont East substation 230/69 kV transformer.
- Rebuild Ft. White South bus to Ginnie substation 230 kV circuit, 11.8 miles.
- Rebuild Ginnie substation to Haile switching station 230 kV circuit, 11.0 miles.
- Rebuild Haile switching station to Archer substation 230 kV circuit, 9.8 miles.
- Rebuild Perpetual Energy substation to Hanson substation 115 kV circuit, 1.6 miles.
- Rebuild Perpetual Energy substation to Madison tap 115 kV circuit, 1.7 miles.
- Rebuild Idylwild substation to Wacahoota tap 69 kV circuit, 10.1 miles.
- Rebuild Zephyrhills N substation to Zephyrhills substation 69 kV circuit, 4.1 miles.

Voltage:

There were no voltage violations on the PEF transmission system in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option I.

Short Circuit:

Short circuit analysis was not performed for sensitivities.

Third Party Impact:

There were no third party thermal violations or voltage violations that were identified in any of the seasons studied that were caused by the interconnection of the Gilchrist simple cycle and combined cycle units using option I.

Conclusions:

Cost Summary

Planning estimate for the cost of each option, in millions

Option	Transmission Cost	Substation Cost	Upgrade Costs	Total Cost
Option B	58.3 0	9.25	117.90	185.45
Option D	132.00	3.75	99.22	234.97
Option E	80.30	6.25	71.96	158.51
Option F	144.98	11.75	85.20	241.93
Option G	111.10	3.75	66.86	181.71
Option H	240.40	70.00	39.36	309.76
Option I	472.40	70.00	30.96	573.36

Recommendation

Option E is the recommended option at this time.

Note that these results are based on the current PEF GIS and transmission service requests which include requests preceding this GIS request. To the extent that one or more of these requests are modified or withdrawn, the results presented in this analysis may no longer be valid and/or may change materially. PEF will advise the customer of any changes associated with the preceding GIS requests that may require a re-study of this GIS request.