PROGRESS ENERGY FLORIDA

Transmission Analysis of the Participation of Bid H in RFP2013PEF

Legal Notice

Executive Summary

Progress Energy Florida (PEF) is evaluating proposals from developers for the construction and eventual supply of approximately 1200 MW of generation. This report summarizes the feasibility evaluation of the following RFP2013 bidder:

Bid H:

518 MW (568 MW winter capability) of combined cycle generation, located in Shady Hills, Pasco County and interconnecting into Hudson 230kV substation through two(2) 0.75 mile, 230 kV lines.

Since the supporting feasibility study was performed as a part of PEF's RFP2013 which evaluated options for adding 1200 MW of generation to PEF's Bulk Electric System (BES), in cases where the subject resource was insufficient to approximate this level of generation by itself, multiple resources were combined in the feasibility study. This report reflects the portion of the results that appear to be applicable to the subject resource.

In addition, this study was performed using the original queue position held by PEF's "Self-Build" option reflected in PEF's 2008 Ten-Year Site Plan. The purpose of using the "Self-Build" queue position rather than using the actual queue position for this request was to allow an equitable evaluation of all options offered in the RFP2013 process, including PEF's "Self-Build" option. Any further studies for this request in the Generator Interconnection process should be performed using study models that include all valid prior queued requests. Results and conclusions drawn in this study and in future studies are subordinate to all valid prior queued requests and may require re-study to determine the effects of these queued requests being withdrawn. Please refer to the PEF's Generator Interconnection Queue published on the OASIS site under http://www.oatioasis.com/fpc/index.html for the latest queue status.

The feasibility study identified incremental thermal overloads on facilities and any steady state voltage impacts due to the interconnection of this grouping of generators, thereby allowing PEF to determine any fatal flaws associated with the proposed interconnection. The incremental impact due to the interconnection was limited mostly to the 230 kV network near the interconnection points. Further evaluation in the form of stability and fault level determination will be required to assess the full impact of these projects. The stability and fault level evaluation shall be part of the system impact study. These evaluations, to be undertaken by PEF will aid in the determination of the system upgrades that may be necessary to accommodate this project and the eventual practical feasibility of the interconnection.

TABLE OF CONTENTS

1.0 Introduction

Progress Energy Florida (PEF) is evaluating proposals from developers for the construction and eventual supply of approximately 1200 MW of generation. The feasibility study included steady state analyses, which determined the impact of the proposed interconnection on the thermal and voltage performance of the system. The proposed supply of 1200MW of generation has an in-service date of year 2013 and therefore the feasibility studies have a study horizon of 2013 and beyond. This report summarizes the feasibility evaluation of the following RFP2013 bidder:

Bid H:

518 MW (568 MW winter capability) of combined cycle generation, located in Shady Hills, Pasco County and interconnecting into Hudson 230kV substation through two(2) 0.75 mile, 230 kV lines.

2.0 Study Approach and Criteria

A benchmarking study was first performed to validate the power flow models provided by PEF, prior to the feasibility studies. The benchmarking study was meant to highlight thermal loading on facilities or voltage problems, if any, in the base cases and provide the results for PEF review. Once benchmarked, these power flow cases served as the baseline cases against which the impact on the system performance due to the proposed interconnection can be compared.

The feasibility study, which determined the incremental impact of the proposed interconnection on the system steady state performance included system intact and single branch contingency evaluation. An in-depth evaluation of the impact of proposed interconnection would include stability and short circuit analyses which shall be performed at the system impact study stage.

The study area included areas in Florida (FRCC) as well as zones in Southern Company (SOCO). All facilities 115 kV and above were included in the evaluation. We used 100% of Rate-B in PSS/E as a screening threshold to flag post-contingency thermal overloads while Rate-A value was used to screen the system intact loading issues. Bus voltages outside the band 0.95 – 1.05p.u were flagged as criteria violation.

3.0 Benchmarking of Base Power Flow Models

3.1 Basecase Development

The following cases were used for the study:

- Power flow case representing the peak load conditions for summer 2013
- Power flow case representing the peak load conditions for winter 2013/14

- Power flow case representing the peak load conditions for summer 2017

The above cases were modified to ensure certain generating units in the area affected by this added generation are online and fully dispatched so as to properly represent stressed transmission system condition.

3.2 Benchmarking Analysis

The base cases were subjected to a system intact and N-1 contingency analysis. The results were tabulated to screen for any thermal loading or bus voltage criteria violations.

3.2.1 System Intact

For the system intact conditions, no thermal loading problems were indicated

No voltage criteria violations were noted in PEF. However criteria violations were indicated in other monitored areas.

3.2.2 N-1 Analysis

After analysis, the pertinent overloaded facilities and the corresponding contingency causing this maximum loading are listed in attached tables.

Any buses with significant post-contingency voltage outside of acceptable limits will be listed in a table at the end of this report.

4.0 Development of the Power Flow Model

The first step was to develop base power flow cases against which the incremental impact of the units can be compared. The generation in the vicinity of the interconnection(s) was assumed to be dispatched fully. Such a dispatch assumption is intended to highlight any incremental transmission capability that may be necessary for the interconnection of new generation.

The resulting power flow cases constituted the base study cases. The transfer study cases were developed by adding:

> 518 MW (568 MW winter capability) of combined cycle generation, located in Shady Hills, Pasco County and interconnecting into Hudson 230kV substation through two(2) 0.75 mile, 230 kV lines.

PEF's system dispatch was adjusted to accommodate the addition of this new unit and the maximization of area generation through economic dispatch of the remaining PEF units and that of other utilities in the affected area. For this purpose, the activity ECDI (economic Dispatch) of PSS/E was used, which models heat-rate and other ranking information of the units that participated in the re-dispatch.

The analyses were performed for three scenarios, namely summer 2013, winter 2013/14 and summer 2017. The results were compared with the base power flow results.

4.1 System Intact Assessment

The system intact system performance of the transfer cases were compared against the base power flow cases. Any significant system intact loading issues will be listed in tables at the end of this report.

5.0 N-1 Assessment

The N-1 assessment involved single branch contingency in the FRCC region as well as portions of Southern Company. All facilities 115 kV and above in these areas were monitored. Only the worst impact/overload for each affected facility will be listed in the tables at the end of this report. Facilities that showed less than 3% impact are excluded from these tables. Significant impacts were noted on many facilities in the interconnection vicinity, which are listed below:

Hudson 230/115 kV TR (connecting to Hudson 115 kV Bus-A): The maximum overload was noted for the outage of parallel transformer. The maximum overload on this facility was:

Summer 2013 - 112% based on its summer rating of 280 MVA
Winter 2013 – 132% based on its winter rating of 280 MVA
Summer 2017 – 103%;

The Hudson 230/115 kV TR, connecting to Hudson bus-B indicated overload only for the winter conditions – 103% for the outage of parallel transformer.

Central Florida 500/230 kV TR #1 and #2: The Central Florida transformers indicated thermal overload for the loss of parallel transformer (overload on TR #1 for the outage of TR #2 and vice versa):

Summer 2013 – TR #1 – 115% based on 840 MVA rating (base loading was 108%); TR #2 – 120% based on 802 MVA loading (base loading was 113%)

Winter 2013 – 130% based on its winter rating of 840 MVA; the base loading was 117%; TR #2 – 122% based on 802 MVA loading (base loading was 108%)

Summer 2017 did not indicate any overloads. This is possibly due to the network upgrades to cater for the Levy generation interconnection

Vandolah 230/69 kV TR #2: This facility indicated overloads for all the three tested scenarios. The maximum overload was noted for the outage of parallel transformer. The maximum overload for this facility was:

Summer 2013 - 100% based on its summer rating of 224 MVA
Winter 2013 – 106% based on its winter rating of 224 MVA
Summer 2017 – 108% based on 224 MVA rating

Ft Wht 230/69 kV TR: This facility indicated overloads for all the three tested scenarios. The maximum overload for this facility was:

Summer 2013 - 102% based on its summer rating of 112 MVA for the outage of Ft. Wht S – Ginnie 230 kV
Winter 2013 – 112% based on its winter rating of 112 MVA for the outage of Ginnie 230/69 kV TR; the base loading for the same contingency was 107%
Summer 2017 – 130% based on 112 MVA rating (base loading was 121%)

Brooksville W 230/115 kV TR This transformer indicated overload for 2017 conditions only, for the outage of parallel transformer. The maximum loading on this transformer was 113%; the base loading was 104%.

The following facilities indicated overloads only for the 2017 summer conditions:

AIP – Lk Nona 230 kV- This facility in FMPP showed 137% overload for the outage of Stantone – Magn Rch 230 kV based on 367 MVA rating (111% loading in base case)

TAFT-Magn Rch 230 kV– showed up to 133% loading for the outage of AIP – Lk Nona 230 kV based on 363 MVA rating (base loading 107%)

Taft – AIP 230 kV- indicated 127% loading for the outage of Stantone – Magn Rch 230 kV (101% loading in base case)

Stantone – Lk Nona 230 kV – showed 104% loading for the outage of Stantone – Magn Rch 230 kV based on 363 MVA rating. There was no overload in the base case.

TAFT – C Center 230 kV – indicated 109% loading for the outage of Intercsn – Can Isl 230 kV based on 367 MVA rating. There was no overload in the base case.

These remaining facilities had marginal overloads (new) or impact, some of which can be attributed to the generation re-dispatch in the Bid H power flow case. These facilities are electrically remote with respect to the Bid H interconnection and the overload may be attributed to the generation re-dispatch rather than the impact of the Bid H interconnection:

WestLak2 – BurnTap 115 kV for the outage of Suwannee – Swiftck1 115 kV
Jasper – BurnTap 115 kV for the outage of Suwannee – Swiftck1 115 kV
BarwikTp– Turner 115 kV for the outage of Debary-Orange C 230 kV
Turner – Highbanks 115kV for the outage of BarwikTp – Turnr 115 kV
Orange C – Highbanks 115 kV for the outage of BarwikTp – Turnr 115 kV

Citrus-FTP_SW 138 kV and Hartman-FTP_SW for the outage of Midway-Nighthawk 230 kV

Further analysis in the System Impact Study will be required make this determination.

From a voltage perspective, the Bid H cases indicated bus voltages less than 0.95 p.u at several buses as well as significant voltage impact (impact >0.01 p.u) at several buses. (Table 12b, 13b and 14b). However a detailed analysis of the power flow cases determined that such voltage impacts are caused due to several Progress Energy units being turned off (by ECDI activity) to accommodate (re-dispatch) the Bid H generation. Therefore, the voltage impacts seen in the Bid H cases may be attributed to the generation dispatch and not necessarily due to the addition of Bid H generation.

6.0 Conclusions

The feasibility study identified incremental thermal overloads on facilities and any steady state voltage impacts due to this proposed interconnection, thereby allowing PEF to determine any fatal flaws associated with the proposed interconnection. Based on the discussion in section 5.0, it may be noted that the incremental loading problems due to the interconnection is limited mostly to the 230 kV network near the generation interconnection. Further evaluation in the form of stability and fault level determination will be required to assess the full impact of this project. The stability and fault level evaluation shall be part of the system impact study. These evaluations, to be undertaken by PEF will aid in the final determination of the system upgrades that may be necessary to accommodate this proposed interconnection.

Since the supporting feasibility study was performed as a part of PEF's RFP2013 which evaluated options for adding 1200 MW of generation to PEF's Bulk Electric System (BES), in cases where the subject resource was insufficient to approximate this level of generation by itself, multiple resources were combined in the feasibility study. This report reflects the portion of the results that appear to be applicable to the subject resource.

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6.1 Identified Needed Transmission Upgrades

An additional 230/115kV XFMR at Hudson and another at Brooksville West (approximately $5M each including some bus work) are needed in order to connect Bid H to the PEF system. Additional projects in PEF's system and the systems of affected parties may be required after further analysis of the impact of adding this generator. This additional analysis will be a part of the System Impact Study for this generator interconnection.