Midwest ISO

Technical Report

Feasibility Study for Generation Interconnection
Queue #38706-01

Feasibility Study Report

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Keywords

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1. SUMMARY

This report contains the Feasibility Study (FS) results for the Midwest ISO (MISO) Generation Interconnection Project #38706-01. The purpose of this study is to identify steady state thermal and voltage violations caused by the proposed generation interconnection. The requested in-service date is October 1, 2007.

Project #38706-01 proposes the addition of 300 MW of wind generation to connect to the ADAIR substation, in Adair County, Missouri, at 161 kV. The generation will be built in the southwest corner of Adair County, with a ten mile line going east to the Adair Substation, as shown in Figure 1. The final interconnection will depend on the thermal, voltage, and stability analysis performed in the Interconnection System Impact Study (ISIS), in addition to operational issues and Facility Study analysis, which will include an evaluation of physical space requirements for the new equipment to support the interconnection.

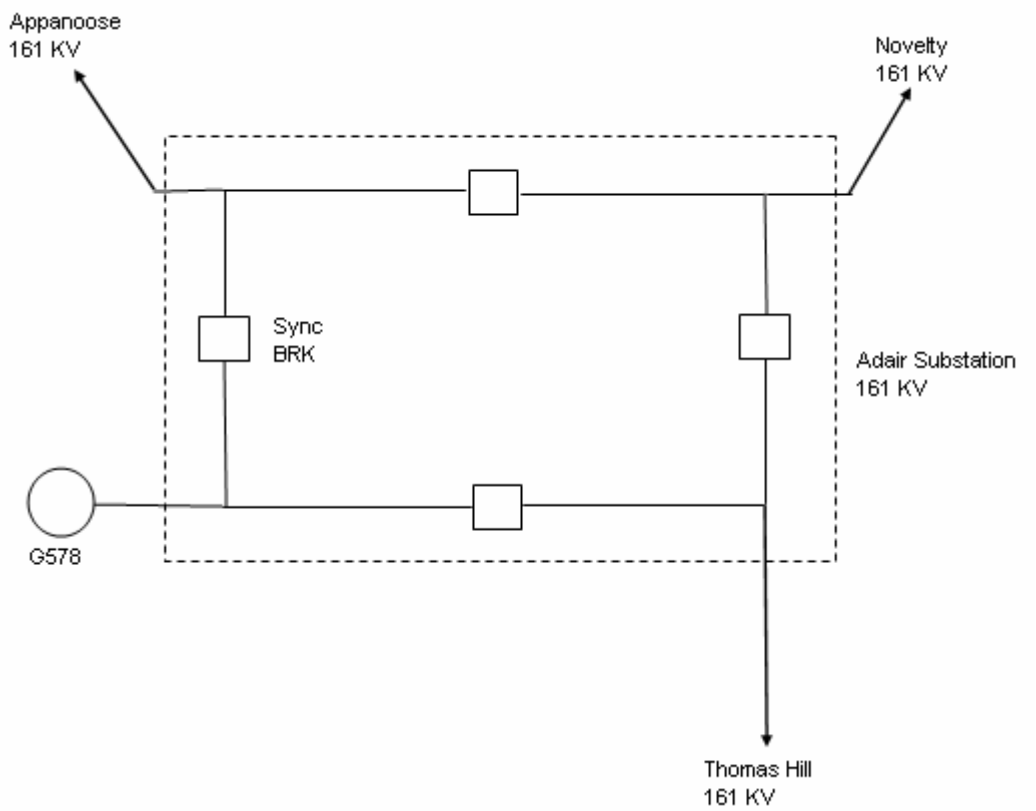

Figure 1: ADAIR Substation and Project 38706-01

An injection analysis study was performed by sourcing 300 MW from project 38706-01 and delivering the power to the MISO footprint. The study identified a handful of branch overload constraints, shown in Table 1 below.

Table 1: Summary of Constraints

Branch	Contingency	Rating	Pre Transfer	Post Transfer	Impact	DF %	FCITC
34189 OTTUMWA5 161 – 34188 OTTUMWA3 345 CKT 1* (ALTW)	OPEN 34190 BRDGPRT5 161 - 34174 EICTAP 5 161 CKT 1 OPEN 34172 EIC 5 161 - 34174 EICTAP 5 161 CKT 1 OPEN 34174 EICTAP 5 161 - 64096 BEACON 5 161 CKT 1	335	315.9	354.4	38.5	12.8	148.8
	OPEN 34174 EICTAP 5 161 - 64096 BEACON 5 161 CKT 1	335	315.9	354.4	38.5	12.8	148.8
	OPEN 64096 BEACON 5 161 - 34174 EICTAP 5 161 CKT 1 DISCONNECT BUS 64627 BEAC MD8 69.0	335	315.7	354.2	38.5	12.8	150.4
	OPEN 64096 BEACON 5 161 - 34174 EICTAP 5 161 CKT 1 OPEN 64096 BEACON 5 161 - 64628 BEACMID8 CKT 2	335	315.3	353.8	38.5	12.8	153.5
	OPEN 34189 OTTUMWA5 161 - 34190 BRDGPRT5 161 CKT 1 OPEN 34190 BRDGPRT5 161 - 34174 EICTAP 5 161 CKT 1 OPEN 34174 EICTAP 5 161 - 64096 BEACON 5 161 CKT 1	335	317.5	355.8	38.3	12.8	137.1
34174 EICTAP 5 161 – 64096 BEACON 5 161 CKT 1* (ALTW / MEC)	OPEN 64050 SE POLK3 345 - 64192 GDMEC 345 CKT 1 OPEN 64064 BONDRNT3 345 - 64080 SYCAMOR3 345 CKT 1 OPEN 64050 SE POLK3 345 - 64634 SE MID 5 161 CKT 1	335	347.5	363	15.5	5.2	0.0

* Local generation adjusted to maximize flows on the constraint.

The proposed project creates new constraints and impacts existing constraints, wherein operation of this plant may be restricted. None of the constraints are classified as injection; therefore the customer is not required to mitigate the constraints in order to gain Energy Resource (ER) status. The study did not identify any voltage limit violations or need for reactive power capability enhancement specifically due to the addition of project 38706-01.

Further Study

The next step in the Generator Interconnection Request process is for the Generator customer to proceed with an ISIS. The ISIS will determine the system upgrades required to resolve all injection limits and will include a detailed analysis verifying these study results along with short circuit, transient and dynamic stability, and deliverability studies, as applicable. Limits identified in the ISIS will also need to be resolved to obtain interconnection service. The ISIS will also determine what upgrades, if any, are necessary for the generation to become a Network Resource (NR), as well the final interconnection configuration at the Adair substation.

The study process included the modelling all of earlier-queued generation projects in the area. The addition of the Norborne generation facility may have removed constraints in the study region. However, because the Norborne plant will not be in service for a few years after the proposed in-service date of the study generation, more constraints may be introduced in the study area. This will be studied further in the ISIS.

Required Interconnection Facilities

To be determined in the ISIS.

Network Upgrades

To be determined in the ISIS.

Special Facility Requirements

To be determined in the ISIS.

Operation Restrictions

To be determined in the ISIS.

2. CRITERIA, METHODOLOGY AND ASSUMPTIONS

2.1 Study Criteria

All relevant MISO-adopted NERC Reliability Criteria are to be met for both the thermal and voltage analysis.

2.2 Study Methodology

The results of this study are subject to change. The results of the Study are based on data provided by the Generator and other MISO system information that was available at the time the study was performed, and the injection study does not guarantee deliverability to the MISO energy market. If there are any significant changes in the generator and controls data, in earlier-queued Generator Interconnection Requests, or in related Transmission Service Requests then the results of this study may also change significantly. Therefore, this request is subject to restudy. The Generator is responsible for communicating any significant generation facility data changes in a timely fashion to MISO prior to commercial operation.

2.2.1 Competing Generation Requests

The Midwest ISO determined in its sole judgment that there were fifteen Generator Interconnection Requests with an earlier queue position that could impact the 38706-01 study results. MISO projects 38049-01, 38267-01, 38518-01, 38548-01, 38601-01, 38602-01, 38612-01, 38667-01, and 38705-01 were included in the model, along with the Ameren-coordinated project 38107-01. Non-MISO generation projects included in the model were Norborne, Gentry, Atchison (all three AECI), 38621-02 (PJM), and Iatan (2^{nd} unit, SPP).

Public information related to the MISO Generator Interconnection Request queue can be found via the MISO web site at **http://oasis.midwestiso.org/documents/ATC/queue.html**

2.2.2 Linear Transfer Analysis and A.C. Power Flow Analysis Methods

Thermal overloads were identified using linear transfer analysis and then verified with AC power flow solutions. The linear transfer analysis was used to evaluate the intact system, N-1 contingency, and certain MISO-defined multi-terminal contingency conditions. The linear transfer analysis utilized adjusted MW ratings for facilities to account for reactive power flows and a 5% transmission reserve margin ("TRM"). All AC power flow solutions utilized actual facility ratings in MVA (i.e. 0% TRM) along with real and reactive power flows. However, the 5% TRM was factored in the computation of required MVA rating for the limiting elements.

The linear transfer analysis was performed using the Linear Transfer Analysis modules of the Managing and Utilizing System Transmission 6.04 (MUST, Version 6.04) program from Power Technologies, Inc (PTI). All AC solutions were performed using the Power Flow module of the

Power System Simulation/Engineering 29 (PSS/E, Version 29) program from Power Technologies, Inc (PTI). These programs are accepted industry-wide for power flow analysis.

2.2.3 Base Cases

2.2.3.1 Power flow analysis

The base case used in the thermal and voltage analysis for this study was developed based on the NERC MMWG 2004 series MISO Central Illinois Group Study (CIGS) model built for the summer of 2009. Two models were taken from this base case; one had the new generation online and the other did not.

The MISO system was modified by updating all loads to the expected coincident peak value and including all earlier-queued generation projects in the area.

2.2.3.2 Deliverability analysis

Deliverability analysis, required for project 38706-01 to attain NR status, was not performed for this study. This will be performed in the ISIS.

2.3 Assumptions

The 38706-01 study generation was modeled at 300 MW of real power output connected to the ADAIR 161 kV substation. The power factor was held between 0.9 and 0.95 leading lag.

3. ANALYSIS RESULTS

3.1 Power Flow Analysis Results

3.1.1 Voltage Analysis & Reactive Capability

Voltage analysis determined that the voltage magnitude of all system buses whose magnitude decreases at least 0.01 p.u. after adding project 38706-01 remain above 0.95 p.u. for the intact system, and remain above 0.9 p.u. for the single contingency condition. Hence, the study did not identify any voltage limit violations or need for reactive power capability enhancement specifically due to the addition of 38706-01. Local planning criteria will be applied during the ISIS in order to determine any reactive support requirements from the generator.

3.1.2 Results of Single Contingencies (N-1)

Study of the 300 MW injection from project 38706-01 identified zero steady-state thermal violations for NERC Category A events (Intact System). Six transmission element violations for NERC Category B events (N-1) were identified.

The proposed project impacts existing constraints, wherein operation of this plant may be restricted. None of the constraints are classified as injection; therefore the customer is not required to mitigate the constraints in order to gain ER status. To obtain NR status, an ISIS must be preformed.