

Impact Study of Limited Operation for Generator Interconnection

GEN-2012-007
ASGI-2012-006

January 2014
Generator Interconnection



Executive Summary

This study report addresses the request of two separate Interconnection Customers (GEN-2012-007 and ASGI-2012-006) to interconnect their requested generators before the completion of all network upgrades identified in their interconnection studies. The two Interconnection Customer's generation totals 142.5 MW of nameplate generation. The following Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) addresses the interconnection of 142.57 MW of generation to be interconnected as an Energy Resource (ER) into the Transmission System of Sunflower Electric Power Corporation (SUNC). GEN-2012-007 is located in Grant County, Kansas. ASGI-2012-006 is located in Stevens County, Kansas and has ties into the Sunflower Electric Power Corporation (SUNC) Transmission System. Under the GIA Section 5.9, these Customers have requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2012-001 (or most recent iteration) Impact Study can be placed into service. This LOIS has been performed again due to the withdrawal of GEN-2012-002.

This LOIS addresses the effects of interconnecting the generators to the rest of the transmission system with the system topology and conditions as expected in March 2014. GEN-2012-007 is requesting the interconnection of twelve (12) Caterpillar (CAT) G20CM34 Gas Reciprocating Engines through a new substation into a tap on the Hickock – Satanta Tap 115kV transmission line. ASGI-2012-006 is requesting the interconnection of a 22.5 MW steam turbine generator with a 17 MW in-house load through a tap on the Hugoton – Rolla 69kV transmission line. For the typical LOIS, both a power flow and transient stability analysis are conducted. The LOIS assumes that only the higher queued projects listed within Table 1 of this study might go into service before the completion of all Network Upgrades identified within Table 2 of this report. If additional generation projects, listed within Table 3, with queue priority equal to or higher than the study project request rights to go into commercial operation before all Network Upgrades identified within Table 2 of this report are completed, this LOIS may need to be restudied to ensure that interconnection service remains for the customer's request.

Power flow analysis from this LOIS has determined that the customer's request will be able to interconnect as an Energy Resource prior to the completion of the required Network Upgrades, listed within Table 2 of this report. Refer to Tables 4 and 5 for the power flow results. Should any additional projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available. It should be noted that although this LOIS analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operational situation. Additionally, the generator may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customers may be required to reduce their generation output to **0 MW** under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Transient stability analysis was performed for the March 2013 study. The transient stability analysis was not performed again for this LOIS.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service must be requested on Southwest Power Pool's OASIS by the Customer.

Table of Contents

Executive Summary	i
Table of Contents	iii
Purpose	1
Facilities	5
Generating Facility	5
Interconnection Facilities	5
Base Case Network Upgrades	6
Power Flow Analysis	7
Model Preparation	7
Study Methodology and Criteria	7
Results	7
Limited Operation and System Reliability	8
Stability Analysis	10
Conclusion	11

Purpose

<OMITTED TEXT> (Interconnection Customers) have requested a study of a Limited Operation System Impact Study (LOIS) under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) for interconnection requests into the Transmission System of Sunflower Electric Power Corporation (SUNC) as well as an Affected System generator embedded in the Sunflower Electric transmission system.

The purpose of this study is to evaluate the impacts of interconnecting GEN-2012-007, a request of twelve (12) CAT G20CM34 Gas Reciprocating Engines through a new substation into a tap on the Hickock – Satanta tap 115kV transmission line Grant County, Kansas, and ASGI-2012-006, a request of a 22.5 MW steam turbine generator with a 17 MW in-house load through a tap on the Hugoton – Rolla 69kV transmission line in Stevens County, Kansas. The Customers have requested this amount to be studied as an Energy Resource (ER) with a Limited Operation Interconnection Service to commence on or around March of 2014.

Both power flow and transient stability analysis were conducted for this Limited Operation Interconnection Service. Limited Operation Studies are conducted under GIA Section 5.9.

The LOIS considers the Base Case as well as all Generating Facilities (and with respect to (b) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the LOIS is commenced:

- a) are directly interconnected to the Transmission System;
- b) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
- c) have a pending higher queued Interconnection Request to interconnect to the Transmission System listed in Table 1; or
- d) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer.

Nothing within this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service rights. Should the Customer require transmission service, those rights should be requested through SPP's Open Access Same-Time Information System (OASIS).

This LOIS study included prior queued generation interconnection requests. Those listed within Table 1 are the generation interconnection requests that are assumed to have rights to either full or partial interconnection service prior to the requested 3/2014 in-service date of the Customers for this LOIS. Also listed in Table 1 are both the amount of MWs of interconnection service

expected at the effective time of this study and the total MWs requested of interconnection service, the fuel type, the point of interconnection (POI), and the current status of each particular prior queued request.

Table 1: Generation Requests Included within LOIS

Project	MW	Total MW	Fuel Source	POI	Status
GEN-2001-039A	105.0	105.0	Wind	Tap Greensburg - Ft Dodge (Shooting Star Tap) 115kV	Commercial Operation
GEN-2001-039M	99.0	99.0	Wind	Central Plains Tap 115kV	Commercial Operation
GEN-2002-025A	150.0	150.0	Wind	Spearville 230kV	Commercial Operation
GEN-2003-006A	200.0	200.0	Wind	Elm Creek 230kV	Commercial Operation
GEN-2003-019	250.0	250.0	Wind	Smoky Hills Tap 230kV	Commercial Operation
GEN-2004-014	100.0	154.5	Wind	Spearville 230kV	Commercial Operation
GEN-2005-012	167.0	250.0	Wind	Spearville 345kV	Commercial Operation
GEN-2006-021	101.0	101.0	Wind	Flat Ridge Tap 138kV	Commercial Operation
GEN-2007-040	132.0	200.0	Wind	Buckner 345kV	Commercial Operation
GEN-2008-018	250.0	405.0	Wind	Finney 345kV	IA Executed/On Schedule
GEN-2008-079	98.9	98.9	Wind	Tap Cudahy - Ft Dodge 115kV	Commercial Operation
GEN-2009-008	199.5	199.5	Wind	South Hays 230kV	IA Executed/On Suspension
GEN-2009-020	48.3	48.3	Wind	Tap Nekoma - Bazine 69kV	IA Executed/On Suspension
GEN-2010-009	165.6	165.6	Wind	Buckner 345kV	Commercial Operation
GEN-2012-007	120.0	120.0	Gas	Rubart 115kV	Facility Study Stage
ASGI-2012-006	22.5	22.5	Steam	Tap Hugoton - Rolla 69kV	Facility Study Stage

This LOIS was required because the Customers are requesting interconnection prior to the completion of all of their required upgrades listed within the latest iteration of their Definitive Interconnection System Impact Study (DISIS). Table 2 below lists the required upgrade projects for which this request has cost responsibility. The Customers were included within the DISIS-2012-001 that was studied in spring 2012 and posted July 26, 2012. The cluster has been restudied since the original posting. These reports can be located here at the following GI Study URL:

http://sppoasis.spp.org/documents/swpp/transmission/GenStudies.cfm?YearType=2012_Impact_Studies.

Table 2: Upgrade Projects not included but Required for Full Interconnection Service

Upgrade Project	Type	Description	Status
Beaver County – Buckner 345kV CKT 1 (Build approx. 90 miles of 345kV)	Most recent iteration of DISIS 2011-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Upgrade	Not authorized to begin construction
Fort Dodge – North Fort Dodge 115kV CKT 2 (Build approx. 1 mile of 115kV)	Most recent iteration of DISIS 2009-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Upgrade	Not authorized to begin construction
Hitchland 345/230kV Autotransformer CKT 2	Most recent iteration of DISIS 2010-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 6/30/2014
Hitchland – Woodward 345kV Dbl CKT	Most recent iteration of DISIS 2011-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 6/30/2014
North Fort Dodge – Spearville 115kV CKT 2	Most recent iteration of DISIS 2009-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Upgrade	Not authorized to begin construction
Spearville – Clark – Thistle 345kV Dbl CKT	Most recent iteration of DISIS 2010-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 12/31/2014
Spearville 345/115/13.8kV Transformer CKT 1	Most recent iteration of DISIS 2009-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Upgrade	Not authorized to begin construction
Thistle – Wichita 345kV Dbl CKT	Most recent iteration of DISIS 2010-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 12/31/2014
Woodward 345/138/13.8kV Transformer CKT 2	Most recent iteration of DISIS 2012-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Balanced Portfolio Project	Current Estimated In-Service date of 5/19/2014

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer. The higher or equally queued projects that were not included in this study are listed in Table 3. While this list is not all inclusive it is a list of the most probable and affecting prior queued requests that were not included within this LOIS, either because no request for an LOIS has been made or the request is on suspension, etc.

Table 3: Higher or Equally Queued GI Requests not included within LOIS

Project	Remainder MW	Total MW	Fuel	POI	Status
GEN-2004-014	54.5	154.5	Wind	Spearville 230kV	Commercial Operation
GEN-2005-012	83.0	250.0	Wind	Spearville 345kV	IA Executed/On Schedule for 2015
GEN-2006-006	205.5	205.5	Wind	Spearville 345kV	IA Executed/On Schedule for 2015
GEN-2006-032	200.0	200.0	Wind	South Hays 230kV	IA Executed/On Suspension
GEN-2006-040	108.0	108.0	Wind	Mingo 115kV	IA Executed/On Suspension
GEN-2007-011	135.0	135.0	Wind	Syracuse 115kV	IA Executed/On Suspension
GEN-2007-038	200.0	200.0	Wind	Spearville 345kV	IA Executed/On Schedule for 08/25/2015
GEN-2007-040	68.0	200.0	Wind	Buckner 345kV	IA Executed/On Schedule for 2012
GEN-2008-017	300.0	300.0	Wind	Setab 345kV	IA Executed/On Schedule for 10/2015
GEN-2008-018	155.0	405.0	Wind	Finney 345kV	IA Executed/On Schedule
GEN-2008-025	101.0	101.0	Wind	Ruleton 115kV	IA Executed/On Schedule for 06/01/2015
GEN-2008-092	201.0	201.0	Wind	Knoll 230kV	IA Pending
GEN-2008-124	200.1	200.1	Wind	Spearville 345kV	IA Executed/On Schedule for 01/01/2016
GEN-2010-015	200.1	200.1	Wind	Spearville 345kV	IA Executed/On Schedule for 01/01/2015

Nothing in this System Impact Study constitutes a request for transmission service or grants the Interconnection Customer any rights to transmission service.

Facilities

Generating Facility

GEN-2012-007 Interconnection Customer’s request to interconnect a total of 120 MW is comprised of twelve (12) Caterpillar (CAT) G20CM34 Gas Reciprocating Engines and associated interconnection facilities. ASGI-2012-006 Interconnection Customer’s request to interconnect a total of 22.5 MW is comprised of a steam turbine generator and associated interconnection facilities with a 17 MW in-house load.

Interconnection Facilities

GEN-2012-007

The POI for GEN-2012-007 Interconnection Customer is through a new substation into a tap on the Hickock – Satanta tap 115kV transmission line in Grant County, Kansas. Figure 1 depicts the one-line diagram of the local transmission system including the POI as well as the power flow model representing the request.

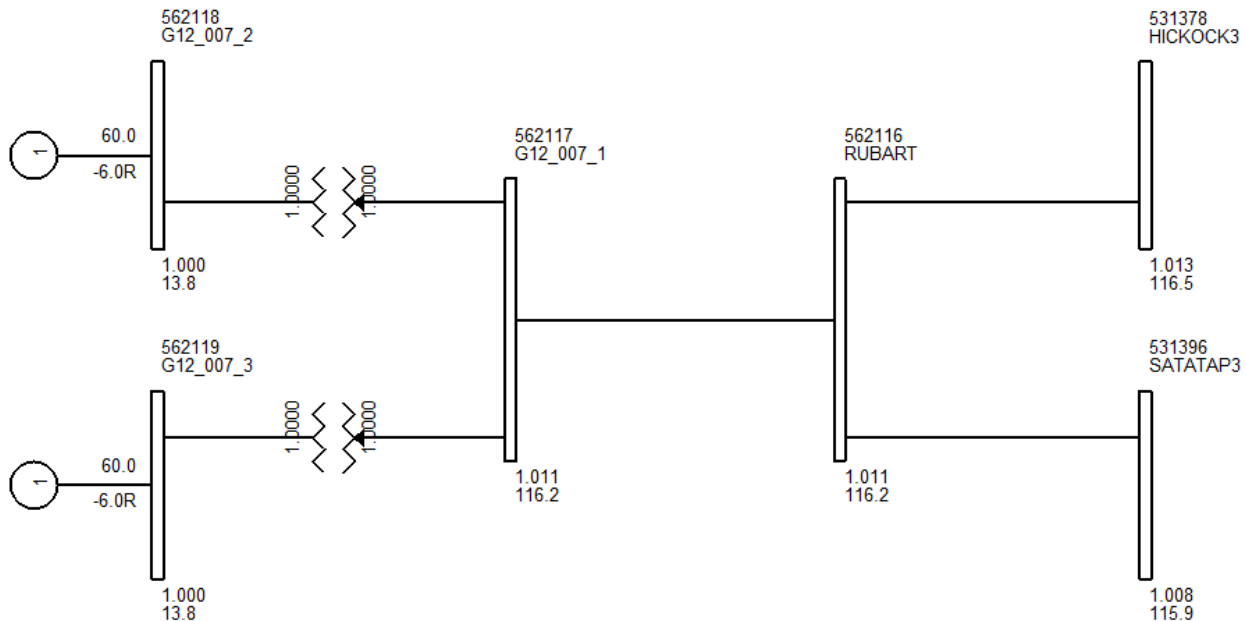


Figure 1: Proposed POI Configuration and Request Power Flow Model

ASGI-2012-006

The POI for ASGI-2012-006 Interconnection Customer is through a tap on the Hugoton – Rolla 69kV transmission line in Stevens County, Kansas. Figure 2 depicts the one-line diagram of the local transmission system including the POI as well as the power flow model representing the request.

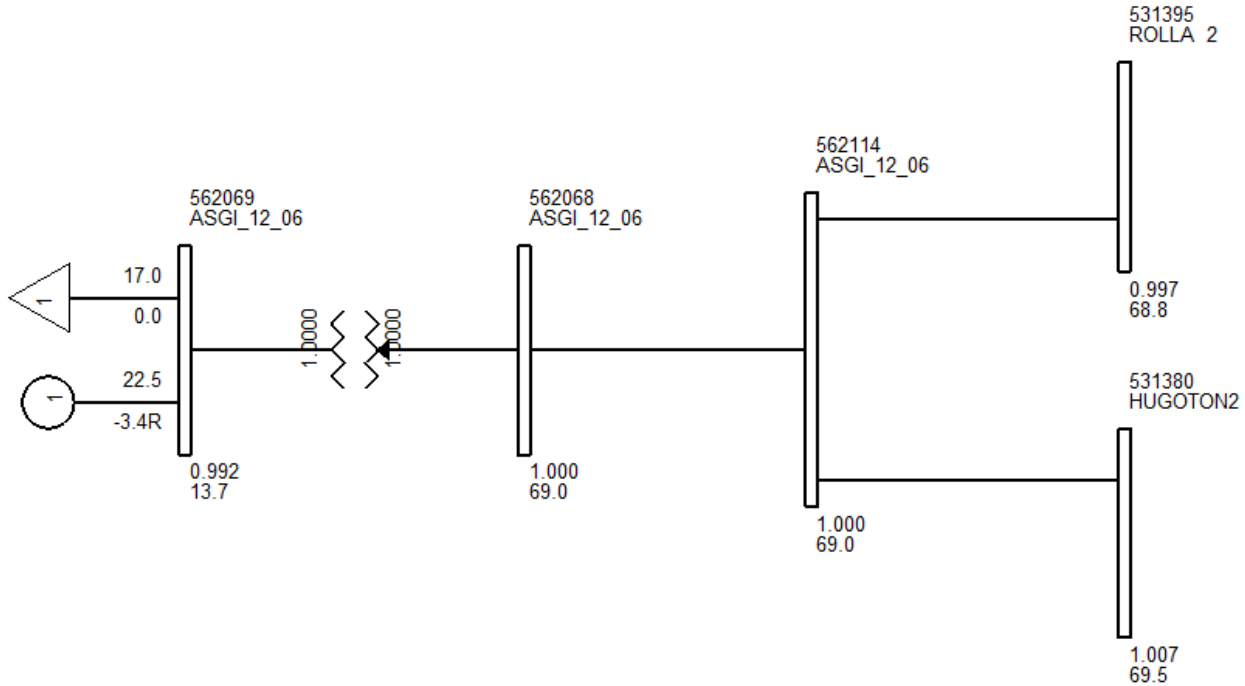


Figure 2: Proposed POI Configuration and Request Power Flow Model

Base Case Network Upgrades

The Network Upgrades included within the cases used for this LOIS study are those facilities that are a part of the SPP Transmission Expansion Plan or the Balanced Portfolio projects that have in-service dates prior to the Customers LOIS requested in-service date of March 2014. These facilities have an approved Notice to Construct (NTC), or are in construction stages and expected to be in-service at the effective time of this study. No other upgrades were included for this LOIS. If for some reason, construction on these projects is delayed or discontinued, a restudy may be needed to determine the interconnection service availability of the Customer.

Power Flow Analysis

Power flow analysis is used to determine if the transmission system can accommodate the injection from the request without violating thermal or voltage transmission planning criteria.

Model Preparation

Power flow analysis was performed using modified versions of the 2012 series of transmission service request study models including the 2014 (spring, summer, and winter) seasonal models. To incorporate the Interconnection Customers' request, a re-dispatch of existing generation within SPP was performed with respect to the amount of the Customers' injection and the interconnecting Balancing Authority. This method allows the request to be studied as an Energy Resource (ERIS) Interconnection Request. For this LOIS, only the previous queued requests listed in Table 1 were assumed to be in-service.

Study Methodology and Criteria

The ACCC function of PSS/E is used to simulate contingencies, including single and multiple facility (i.e. breaker-to-breaker, etc.) outages, within all of the control areas of SPP and other control areas external to SPP and the resulting data analyzed. This satisfies the "more probable" contingency testing criteria mandated by NERC and the SPP criteria.

The contingency set includes all SPP control area branches and ties 69kV and above, first tier Non-SPP control area branches and ties 115 kV and above, any defined contingencies for these control areas, and generation unit outages for the SPP control areas with SPP reserve share program redispatch.

The monitor elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier Non-SPP control area branches and ties 69 kV and above. NERC Power Transfer Distribution Flowgates for SPP and first tier Non-SPP control area are monitored. Additional NERC Flowgates are monitored in second tier or greater Non-SPP control areas. Voltage monitoring was performed for SPP control area buses 69 kV and above.

Results

The LOIS ACCC analysis indicates that the Customers can interconnect its generation into the SUNC transmission system before all required upgrades listed within the DISIS-2012-001 study can be placed into service. Refer to Tables 4 and 5 for the Limited Operation Interconnection Service available at the interconnect date of March 2014 due to interconnection constraints. Should any other GI projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available.

ACCC results for the LOIS can be found in Tables 4 and 5 below. Generator Interconnection Energy Resource analysis doesn't mitigate for those issues in which the affecting GI request has less than a 20% OTDF.

Limited Operation and System Reliability

In no way does this study guarantee limited operation for all periods of time. It should be noted that although this LOIS analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer may be required to reduce their generation output to **0 MW** under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Table 4: Interconnection Constraints for Mitigation of GEN-2012-007 LOIS @ 120.0MW

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	Max MW Available	Contingency
ALL			NA					120	NA

Table 5: Interconnection Constraints for Mitigation of ASGI-2012-006 LOIS @ 22.5MW

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	Max MW Available	Contingency
ALL			NA					22.5	NA

Stability Analysis

Stability Analysis was not repeated for this LOIS.

Conclusion

<OMITTED TEXT> (Interconnection Customers, GEN-2012-007 and ASGI-2012-006) have requested a Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 142.5 MW of generation to be interconnected as an Energy Resource (ER) into the Transmission System of Sunflower Electric Power Corporation (SUNC) in Grant County, Kansas. ASGI-2012-006 is located Stevens County, Kansas in the Pioneer Electric Cooperative system and is embedded in the Sunflower Electric Power Corporation (SUNC) Transmission System. The point of interconnection for GEN-2012-007 will be through a new substation into a tap on the Hickock – Satanta Tap 115kV transmission line. The point of interconnection for ASGI-2012-006 will be through a tap on the Hugoton – Rolla 69kV transmission line. The Customers, under GIA Section 5.9, has requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2012-001 (or most recent iteration) Impact Study can be placed into service.

Power flow analysis from this LOIS has determined that the Customers request can interconnect their generation as an Energy Resource prior to the completion of the required Network Upgrades, listed within Table 2 of this report. Refer to Tables 4 and 5 for the Limited Operation Interconnection Service available due to interconnection constraints.

Transient stability analysis was not performed again for this LOIS.

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer or Customers.

Nothing in this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service.