LG&E ENERGY

Kent W. Blake
Director
State Regulation and Rates

LG&E Energy LLC
220 West Main Street
Louisville, Kentucky 40202
502-627-2573
502-217-2442 FAX
kent.blake@lgeenergy.com

May 11, 2005

Elizabeth O'Donnell
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40602-0615

RE: ***Application of Louisville Gas and Electric Company for a Certificate of Public Convenience and Necessity for the Construction of Transmission Facilities in Trimble County, Kentucky*** *- Case No. 2005-00155*

Dear Ms. O'Donnell:

Enclosed please find an original and ten (10) copies of Louisville Gas and Electric Company's ("LG&E") Application and Testimonies of Mark S. Johnson and J. Nate Mullins in the above-referenced docket.

Should you have any questions concerning the enclosed, please do not hesitate to contact me.

Sincerely,

Kent W. Blake

Kent W. Blake

cc: Hon. Elizabeth E. Blackford
Hon. Michael L. Kurtz

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF TRANSMISSION FACILITIES IN TRIMBLE COUNTY, KENTUCKY	))))))	**CASE NO. 2005-00155**

* * * * * * * * * * *

APPLICATION

Louisville Gas and Electric Company ("LG&E"), pursuant to KRS 278.020, et seq., 807 KAR 5:001 and 807 KAR 5:120, hereby applies to the Kentucky Public Service Commission ("Commission") for a Certificate of Public Convenience and Necessity for the construction of certain electric transmission facilities to be located in Trimble County, Kentucky. In support of this Application, LG&E states as follows:

1. Address. LG&E's full name and business address is Louisville Gas and Electric Company, 220 West Main Street, Louisville, Kentucky 40202. LG&E's mailing address is P.O. Box 32010, Louisville, Kentucky 40232.

2. Articles of Incorporation. Certified copies of LG&E's Articles of Incorporation are already on file with the Commission in *In the Matter of: Joint Application of E.ON AG, PowerGen plc, LG&E Energy Corp., Louisville Gas and Electric Company and Kentucky Utilities Company for Approval of an Acquisition*, Case No. 2001-104, and are incorporated herein by reference pursuant to 807 KAR 5:001, Section 8(3).

3. Description of Proposed Transmission Facilities. LG&E seeks a certificate of public convenience and necessity to construct a 345 kV transmission line, approximately 2.5 miles in length (of which, approximately 0.8 miles is located in Kentucky and approximately 1.7 miles is located in Indiana), running from the proposed 750 MW nominal net (732 MW summer rating) supercritical pulverized coal fired base load generating unit to be located at the Trimble County Generating Station ("TC2") across the Ohio River to interconnect with an existing 345 kV transmission line near Marble Hill, Indiana. LG&E will own 100% of the proposed transmission line. 807 KAR 5:001, Section 9(2)(c).

4. Notice of Intent. LG&E filed its Notice of Intent to file this Application with the Commission on April 11, 2005, pursuant to 807 KAR 5:120, Section 1. A copy of the Notice of Intent is attached hereto as Exhibit 1.

5. Statement of Necessity. The proposed transmission facilities will be utilized to transmit electric power from TC2 in order to accommodate the operation of TC2. The direct testimony of Mark S. Johnson, submitted herewith, contains a detailed discussion of the need for the transmission facilities and is incorporated herein by reference. 807 KAR 5:001, Section 9(2)(a).

6. Statement of Convenience. The route of the transmission line is designed to serve the projected load with as little negative impact as can be reasonably afforded. The final route was determined after conducting field surveys, evaluating the topography and geology along the routes considered and adjusting the routes as appropriate, consistent with sound engineering principles. The lines are designed to mitigate impacts to existing property improvements, developments and known uses of the land. Thus, the

routes for the lines are designed to provide the needed facilities to serve the projected load while minimizing the negative impacts of the projects. The direct testimony of Nate Mullins, submitted herewith, contains a detailed discussion of the reasons that the proposed construction serves the public convenience and is incorporated herein by reference. 807 KAR 5:001, Section 9(2)(a).

7. Permits or Franchises. LG&E is not required to obtain franchises from any public authorities and, thus, none are submitted herewith as required by 807 KAR 5:001, Section 9 (2)(b). LG&E has obtained no permits from public authorities and, thus, none are submitted herewith as required by 807 KAR 5:001. Section 9(2)(b). LG&E may be required to obtain requisite FAA, highway and railroad crossing permits as well as certain environmental and construction-related permits associated with the construction of the proposed transmission line. Copies of those permits will be filed with the Commission, as obtained, to the extent required by law or requested by the Commission.

8. Description of Locations and Routes. A full description of the proposed location and route of the transmission facilities is contained in the direct testimony of Nate Mullins, together with a description of the manner in which the same will be constructed, as required by 807 KAR 5:001, Section 9(2)(c). The proposed transmission line will not compete with any public utilities, corporations or persons.

9. Route Maps. Pursuant to 807 KAR 5:001, Section 9(2)(d) and 807 KAR 5:120, Section 2(2), maps in a scale of 1 inch equals 400 feet showing the proposed transmission line, including the affected property boundaries as indicated on the counties' property valuation administrators' maps, and the location of all facilities, rights of way and easements are submitted herewith as exhibits to the direct testimony of Nate Mullins,

together with sketches of proposed typical transmission line support structures and separate maps showing any alternative routes that were considered.

10. Financing of Construction. LG&E expects to finance the cost of construction of the proposed facilities with a combination of new debt and equity. The debt is expected to be a combination of short-term debt, in the form of commercial paper notes, loans from affiliates via the money pool, bank loans, and/or long-term intercompany loans from E.ON affiliates. LG&E will seek the Commission's approval of any debt instruments as necessary. The additional equity will come in two forms: retaining current earnings and equity contributions from LG&E Energy. The mix of debt and equity used to finance the project will be determined so as to allow LG&E to maintain its strong investment-grade credit ratings. LG&E will continue to evaluate financing alternatives during construction of the projects and will seek the approval of the Commission before entering into any alternative financing as necessary. 807 KAR 5:001, Section 9(2)(e).

11. Cost of Operation. The estimated cost of operation of the proposed transmission facilities is anticipated to be de minimis in the first six years of operation; thereafter, based on historical averages, operations and maintenance expense attributable to the transmission line is estimated to be approximately $9,000 to $9,500 per year. 807 KAR 5:001, Section 9(2)(f).

12. Notice to Landowners. The undersigned hereby verifies that, according to property valuation administrator records in each of the Kentucky counties in which the proposed construction will be located, each property owner over whose property the transmission line is proposed to cross has been sent by first-class mail, addressed to the

property owner at the owner's address as indicated by the county property valuation administrator records, or by hand delivery, a notice containing the information set forth in 807 KAR 5:120, Section 2(3). A sample copy of each such notice is attached hereto pursuant to 807 KAR 5:120, Section 2(4) and designated Exhibit 2. A list of the names and addresses of the landowners to whom such notice was sent is attached hereto pursuant to 807 KAR 5:120, Section 2(4) and designated Exhibit 3.

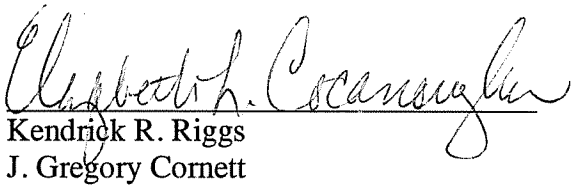
13. Newspaper Notice. Notice of the intent to construct the proposed transmission line has been published in newspapers of general circulation in Trimble County, Kentucky, which notice included the information set forth in 807 KAR 5:120, Section 2(5). Copies of the newspaper notice for the transmission line are attached hereto pursuant to 807 KAR 5:120, Section 2(6) and designated, collectively, Exhibit 4.

14. Effect on Financial Condition of Utility. The proposed projects do not involve sufficient capital outlay to materially affect the financial condition of LG&E. 807 KAR 5:120, Section 2(7).

WHEREFORE, Louisville Gas and Electric Company respectfully requests the Commission to issue an order granting it a certificate of public convenience and necessity for the construction of a 345 kV transmission line running from the proposed TC2 in Trimble County across the Ohio River, and for any and all other relief to which it may be entitled.

Dated: May 11, 2005

Respectfully submitted,



Kendrick R. Riggs
J. Gregory Cornett
Ogden Newell & Welch PLLC
1700 PNC Plaza
500 West Jefferson Street
Louisville, Kentucky 40202
Telephone: (502) 582-1601

Robert M. Watt, III
Lindsey W. Ingram, III
Stoll, Keenon & Park, LLP
300 West Vine Street, Suite 2100
Lexington, Kentucky 40507
(859) 231-3000

Elizabeth L. Cocanougher
Senior Regulatory Counsel
Louisville Gas and Electric Company
220 West Main Street
Post Office Box 32010
Louisville, Kentucky 40232
Telephone: (502) 627-4850

Counsel for Louisville Gas and Electric Company

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Kent W. Blake**, being duly sworn, deposes and says he is Director of State Regulation and Rates for LG&E Energy Services Inc., on behalf of Louisville Gas and Electric Company, hereby states that he has read the foregoing Application and that the statements contained therein are true and correct to the best of his knowledge and belief.

Kent W. Blake
KENT W. BLAKE

The foregoing verification was subscribed and sworn to before me, a Notary Public in and before said County and State, by Kent W. Blake, as Director of State Regulation and Rates for LG&E Energy Services Inc., on this 11th day of May 2005.

Tammy J. Elzy
NOTARY PUBLIC

My commission expires: _____

TAMMY J. ELZY
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY
My Commission Expires Nov. 9, 2006

LG&E ENERGY

Kent W. Blake
Director
State Regulation and Rates

LG&E Energy LLC
220 West Main Street
Louisville, Kentucky 40202
502-627-2573
502-217-2442 FAX
kent.blake@lgeenergy.com

April 11, 2005

RECEIVED

APR 11 2005

PUBLIC SERVICE COMMISSION

Elizabeth O'Donnell
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40601

Case 2005-00155

RE: ***In the Matter of: Application of Louisville Gas and Electric Company for the Construction of Transmission Facilities in Trimble County, Kentucky***

Dear Ms. O'Donnell:

Please take notice that, pursuant to KRS 278.020 and 807 KAR 5:120, Louisville Gas and Electric Company plans to file, on or after May 11, 2005, an application for a certificate of public convenience and necessity for the construction of a 345 kV transmission line in Trimble County, Kentucky. Specifically, that proposed line will run from the Trimble County Generating Station in Trimble County and across the Ohio River into Indiana. Please assign this matter a docket number and advise us of same.

The business address and telephone number for this utility is:

220 West Main Street
Louisville, Kentucky 40202
Telephone: (502) 627-2000

Should you have any questions, please contact me at your first convenience.

Very truly yours,

Kent W. Blake

Kent W. Blake

cc: Beth Cocanougher
Greg Cornett

REVISED NOTICE

[Date]

[property owner (per PVA)]
[owner's address (per PVA)]

RE: Notice of Proposed Construction of Electric Transmission Line

Dear [Mr. / Ms. _____]:

Kentucky Utilities Company (KU) plans on constructing a 345,000 volt electric transmission line from our Trimble County generating station to an existing transmission line across the Ohio River in Indiana. This line is part of our continuing efforts to meet the increasing energy needs of our customers. Part of the planned line would cross your property.

KU has notified the Kentucky Public Service Commission that we plan to apply for regulatory approval for construction of the planned line. The Commission has assigned the case docket number **2005-00155**. If the Commission does approve construction of the line, representatives of KU will contact you later this year to purchase an easement allowing us to build the planned line across a portion of your property.

In addition, under Kentucky law, after KU has filed its application with the Commission, you have the right to request that the Kentucky Public Service Commission hold a local public hearing regarding the planned line. You also have the right to ask to intervene in the case. If you would like to request a local public hearing, the request must be made in writing to the Executive Director of the Kentucky Public Service Commission. The Executive Director's address is:

Executive Director
Public Service Commission
211 Sower Boulevard
P.O. Box 615
Frankfort, Kentucky 40602

Any written request for a hearing must be made no later than thirty (30) days after KU has filed an application for a certificate of public convenience and necessity for the planned line. We have not filed that application yet but will file it on or after May 9, 2005. Any written request for a hearing will need to include the following:

1. the docket number of the case (the docket number for this case is **2005-00155**);
2. the name, address, and telephone number of the person requesting the hearing; and,
3. a statement as to whether the person requesting the hearing wishes to participate in an evidentiary hearing or to make unsworn public comment.

If you wish to participate in an evidentiary hearing, you will also need to intervene in the case. You may request to intervene by filing a motion pursuant to 807 KAR 5:001, Section 3(8). If you would like to contact the Executive Director's office by telephone, the number is (502) 564-3940.

We want you to know we are dedicated to keeping you informed throughout this process. For additional information about the project, log on to the LG&E Energy Web site (www.lgeenergy.com/TC2). We have also established a toll-free message line (877) 606-4773 for you to leave questions.

Sincerely,

Mark S. Johnson
Director - Transmission

[Date]

[property owner (per PVA)]
[owner's address (per PVA)]

RE: Notice of Proposed Construction of Electric Transmission Line

Dear [Mr. / Ms._____]:

Louisville Gas and Electric Company (LG&E) plans on constructing a 345,000 volt electric transmission line from our Trimble County generating station to an existing transmission line across the Ohio River in Indiana. This line is part of our continuing efforts to meet the increasing energy needs of our customers. Part of the planned line would cross your property. The route of the planned line is set forth on the map enclosed with this letter.

LG&E has notified the Kentucky Public Service Commission that we plan to apply for regulatory approval for construction of the planned line. The Commission has assigned the case docket number 2005-00142. If the Commission does approve construction of the line, representatives of LG&E will contact you later this year to purchase an easement allowing us to build the planned line across a portion of your property.

In order to provide information to you and the owners of other properties that would be affected by the planned line, LG&E will hold a public information session at Trimble County High School located at 1029 Highway 421 in Bedford on Thursday, April 28, 2005 from 6:00 p.m. to 8:00 p.m. We welcome and encourage you to attend the session to learn more about the planned line. We also want you to know we are dedicated to keeping you informed throughout this process. For additional information about the project, log on to the LG&E Energy Web site (www.lgeenergy.com/TC2) after April 19, 2005. We have also established a toll-free message line (877) 606-4773 for you to leave questions.

In addition, under Kentucky law, after LG&E has filed its application with the Commission, you have the right to request that the Kentucky Public Service Commission hold a local public hearing regarding the planned line. You also have the right to ask to intervene in the case. If you would like to request a local public hearing, the request must be made in writing to the Executive Director of the Kentucky Public Service Commission. The Executive Director's address is:

Executive Director
Public Service Commission
211 Sower Boulevard
P.O. Box 615
Frankfort, Kentucky 40602

Any written request for a hearing must be made no later than thirty (30) days after LG&E has filed an application for a certificate of public convenience and necessity for the planned line. We have not filed that application yet but will file it on or after May 9, 2005. Any written request for a hearing will need to include the following:

1. the docket number of the case (the docket number for this case is 2005-00142);
2. the name, address, and telephone number of the person requesting the hearing; and,
3. a statement as to whether the person requesting the hearing wishes to participate in an evidentiary hearing or to make unsworn public comment.

If you wish to participate in an evidentiary hearing, you will also need to intervene in the case. You may request to intervene by filing a motion pursuant to 807 KAR 5:001, Section 3(8). If you would like to contact the Executive Director's office by telephone, the number is (502) 564-3940.

The planned line is very important to the continued reliability of our electric transmission system. We encourage you to attend the public information session at Trimble County High School on Thursday, April 28, 2005 from 6:00 p.m. to 8:00 p.m. to learn more about the project.

Sincerely,

Mark S. Johnson
Director - Transmission

Tyrone to W Frankfort New Easement Mailing List

Name One	Name Two	Address One	Address Two	City	State	Zip
Rowlett Family Limited Partnership, Howard A Rowlett / General Partner		8224 Carrollton Rd		Campbellsburg	KY	40011

Exhibit 3

NOTARIZED PROOF OF PUBLICATION

STATE OF KENTUCKY

COUNTY OF Franklin

Before me, a Notary Public, in and for said County and State, this 5th day of May, 2005, came Rachel McCarty personally known to me, who being duly sworn, states as follows:

That she is Advertising Assistant of the Ky Press Service, Inc., and that the following publications: Louisville Courier Journal ran the Legal Notice for Kentucky Utilities, Notice to Company Customers (Case No. 2005-00155). Notice of Proposed Electric Transmission Line.

Rachel McCarty
Signed

Bonnie J. Howard
Notary Public

My commission expires 9-18-08

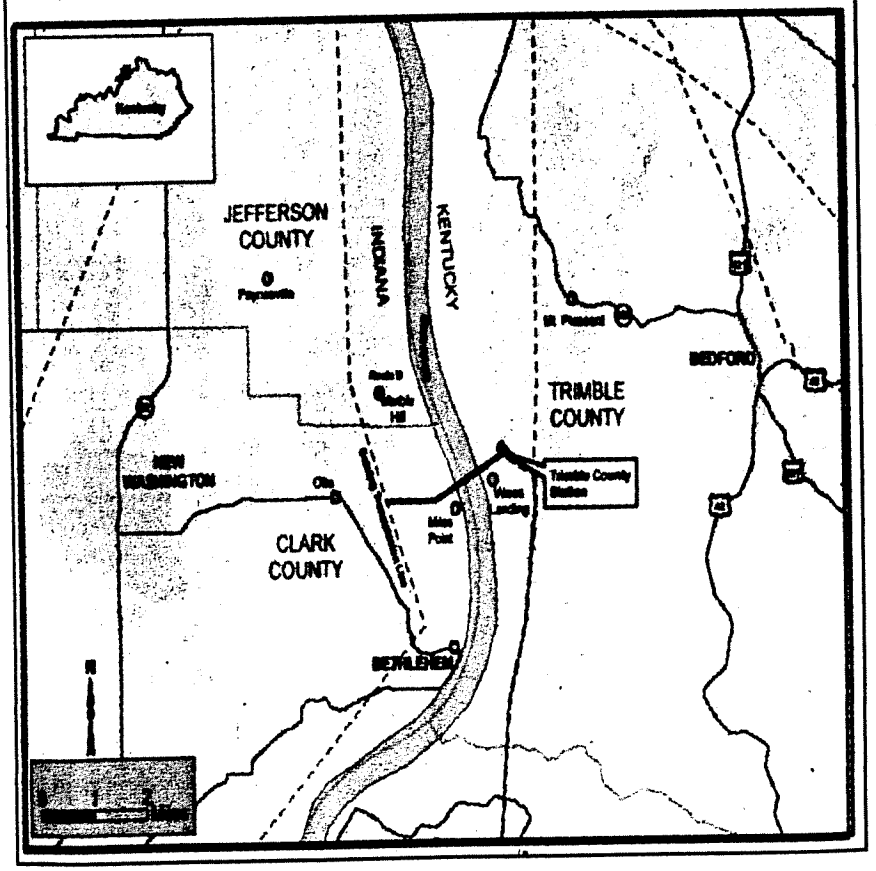
F4 | Thursday, April 28, 2005 | THE COURIER-JOURNAL
The Courier-Journal

NOTICE OF PROPOSED ELECTRIC TRANSMISSION LINE CONSTRUCTION PROJECT

Louisville Gas and Electric Company ("LG&E") propose to construct a 345 kV transmission line to run from the Trimble County Generating Station in Trimble County and across the Ohio River into Indiana. The purpose of the proposed transmission line is to accommodate the new generating unit proposed to be constructed in Trimble County. An application for a certificate of public convenience and necessity for that proposed additional generation unit is currently before the Kentucky Public Service Commission ("Commission") in Case No. 2004-00507. A map showing the expected route of the proposed line is shown below.

LG&E plans to file an application with the Commission on or about May 11, 2005, seeking a certificate of public convenience and necessity authorizing construction of the proposed transmission line. The purpose of the Commission's review of the LG&E's application is to determine whether the proposed transmission line is required by the public convenience and necessity. Any interested person, including a person over whose property the proposed transmission line will cross, may request intervention in this proceeding, and may request that the Commission conduct a public hearing in Trimble County.

To seek intervention in the Commission's proceeding on LG&E's application for a certificate of public convenience and necessity for the proposed transmission line, or to request a local public hearing in that case, contact the Executive Director, Public Service Commission, 211 Sower Boulevard, P.O. Box 615, Frankfort, Kentucky 40602, telephone number (502) 564-3940. The docket number under which this application will be processed is 2005-00155.



COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF TRANSMISSION FACILITIES IN TRIMBLE COUNTY	)))))	CASE NO. 2005-00155

TESTIMONY OF
MARK S. JOHNSON
DIRECTOR, TRANSMISSION
LG&E ENERGY SERVICES INC.

Filed: May 11, 2005

Q. Please state your name, position and business address.

A. My name is Mark S. Johnson. I hold the position of Director of Transmission for LG&E Energy Services Inc. on behalf of Louisville Gas and Electric Company ("LG&E" or "Company"). My business address is 220 West Main Street, P.O. Box 32020, Louisville, Kentucky 40202.

Q. Please describe your educational and professional background.

A. I received my Bachelor of Science degree in Civil Engineering Technology from Murray State University in 1980. I have 23 years of experience in the utility industry. From May 1980 to January 1985, I was employed by the Tennessee Valley Authority at the Watts Bar Nuclear Generating Station, where I held the position of Manager, Document Control and Configuration Management. From January 1985 to February 1987, I was employed by Entergy at the Grand Gulf Nuclear Generation Station as Manager, Engineering Support. From February 1987 to November 1997, I was again employed by the Tennessee Valley Authority, where I held a number of senior level positions in power generation, transmission, customer service and marketing. Most notably, I was Area Vice President, Transmission, Customer Service and Marketing for three and one-half years. Then, in November 1997, I joined LG&E Energy as Director, Distribution Operations. I remained in that position until January 2001, when I assumed my current position.

Q. Have you previously testified before this Commission?

A. Yes. I filed rebuttal testimony on February 9, 2004 in the case entitled *In the Matter of: Investigation Into the Membership of Louisville Gas and Electric Company and Kentucky Utilities Company in the Midwest Independent Transmission System Operator, Inc.*, Case

No. 2003-00266 I also filed testimony on November 12, 2003 in the case entitled *In the Matter of: An Investigation of the Proposed Construction of 138 kV Transmission Facilities in Mason and Fleming Counties by East Kentucky Power Cooperative, Inc.*, Case No. 2003-00380.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following Exhibits:

- Exhibit MSJ-1, System Impact Study;
- Exhibit MSJ-2, Report, Generation Interconnection Evaluation of a 750 MW Generating Power Plant at Trimble County, KY.; and
- MSJ-3, Facility Study Report

Q. What is the purpose of your testimony?

A. My testimony will provide an overview of the transmission facilities being proposed in this proceeding, explain the need for the facilities, describe the study performed to determine that need, and detail why the Company's Application should be approved.

Q. Please describe the facilities which the Company is proposing to construct.

A. The Company is seeking a certificate of public convenience and necessity ("CCN") for a 345 kV transmission line which will be located in Trimble County, Kentucky. Specifically, this proposed line will be approximately 2.5 miles long and will run generally from the Trimble County Generating Station ("Trimble County Station") across the Ohio River, where it will connect with an existing, Public Service Indiana-owned 345 kV line near Marble Hill, Indiana (the "Trimble County Line"). Approximately 0.8 miles of the line will be located in Kentucky. This line is described more specifically in

the testimony of Nate Mullins, and depicted on exhibits to that testimony, filed concurrently as part of this proceeding.

Q. Why is the Company proposing to construct the Trimble County Line?

A. In short, the Company is proposing to construct this line because it is needed for the Company to be able to deliver reliable service to its growing native load. Specifically, the Company, together with Kentucky Utilities Company ("KU"), has filed a Joint Application for a CCN for the expansion of the Trimble County Station through the construction of a 750 MW nominal net super-critical pulverized coal-fired base load generating unit ("TC2"). As discussed in the testimony of David Sinclair in that case, LG&E and KU (collectively "the Companies") presented their 2004 Joint Load Forecast ("Forecast"), which projects that the Companies will need base load capacity beginning in 2010, and will need between 401 MW and 552 MW of additional capacity by 2012, in order to maintain the present reserve margin range of 13% to 15%. In addition, the Companies presented a Resource Assessment which established that the construction of TC2 is the least-cost way to meet base load capacity needs. The proposed transmission line is necessary to provide stability for the output from TC2, as set forth in the study attached as MSJ-2.

Q. How did the Company determine the need for the proposed transmission line?

A. LG&E determined that need based on studies performed by the Midwest Independent Transmission System Operator, Inc. ("MISO"). Specifically, MISO performed a Transmission Service System Impact Study ("System Impact Study") to identify constraints in the MISO transmission footprint, and in adjacent non-MISO transmission systems, that might limit the delivery of power from TC2, and to make recommendations

to address any system limitations. A copy of the System Impact Study is attached as Exhibit MSJ-1, and incorporated herein by reference. MISO also performed a Generation Interconnection Evaluation Study ("Interconnection Study") to determine the impact of a TC2 interconnection on power system stability, short circuit interruption requirements and potential contingency cascading problems. A copy of the Interconnection Study is attached as Exhibit MSJ-2 and incorporated herein by reference. In addition, MISO conducted a Facility Study Report for the options identified in the System Impact Study. A copy of that Report is attached as Exhibit MSJ-3 and incorporated herein by reference. The Companies reviewed MISO's reports and concurred with the findings set forth therein.

Q. What were the results of the studies performed by MISO?

A. The System Impact Study identified four transmission facility expansion options to alleviate thermal issues related to the delivery of power from TC2. LG&E, together with KU, then assessed those four options and decided to pursue the fourth option presented by MISO. The Interconnection Study concluded that: three of the four options presented in the System Impact Study, including the option ultimately chosen by KU and LG&E, resulted in continued system stability with the addition of TC2; the addition of TC2 would result in the increase of fault currents in a number of breakers in the system, but that those increased currents were expected to be within the breaker current interruption capabilities; and the addition of TC2 would not create any new cascading outages in the system. The Facility Study Report sets forth key events in the construction timelines for the four options identified in the System Impact Study.

Q. Did LG&E assess whether any alternative options to the construction proposed in this proceeding could meet its needs?

A. Yes. As discussed above, in the System Impact Study MISO studied and identified four options for alleviating thermal issues related to the delivery of power from TC2. LG&E and KU then assessed those options and chose to pursue the fourth option identified in the System Impact Study. The Companies chose that option because because it would alleviate the transmission issues identified and was the least total cost of the options. .

Q. Is the need for the Trimble County Line dependent upon the approval of the Joint Application for the CCN for TC2?

A. As I explained earlier, the Forecast projects a growing native load and the need for base load capacity beginning in 2010. The need for the specific transmission line being proposed in this proceeding was determined based upon the expectation that LG&E will meet its base load capacity needs through the construction of TC2. However, if those capacity needs were to be met through some other means, the Company would still require additional transmission facilities to meet the need, although those facilities might be different from the specific line proposed here.

Q. Will the construction of the Trimble County Line result in any unnecessary duplication of facilities?

A. No. MISO's System Impact Study, attached as Exhibit MSJ-1, reviewed the adequacy of existing lines, including the possibility of upgrades to those lines, and determined that those lines were not adequate and that certain additional lines were needed. As previously explained, MISO presented four options for alleviating thermal issues related

to the delivery of power from TC2, and the Companies assessed those options and chose to pursue the fourth option identified in the System Impact Study.

Q. Please explain why the transmission line proposed by the Company in this proceeding is required by public convenience and necessity.

A. As a regulated utility in Kentucky, LG&E has an obligation to provide dependable service to customers located in its certified territory. The Company has projected growth in its native load, and has established a need for additional base load capacity in order to serve that growing load. The proposed line is consistent with, and necessary to provide for, the public convenience and necessity because it is required to allow the Company to meet the needs of its growing native load.

Q. Do you have a recommendation for this Commission?

A. Yes. For all of the reasons set forth in the Company's Application, and in my testimony and the testimony of Mr. Mullins, it is my recommendation that the Commission grant the Company's Application for a CCN, finding that the Company has established a need for the proposed transmission line and that the route selected is reasonable and appropriate.

Q. Does this conclude your testimony?

A. Yes, it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Mark S. Johnson**, being duly sworn, deposes and says he is Director of Transmission for LG&E Energy Services Inc., that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

MARK S. JOHNSON

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 10th day of May 2005.

Notary Public

My Commission Expires:

_____

VICTORIA B. HARPER
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY
My Commission Expires Sept. 20, 2006

System Impact Study A-024 for MISO OASIS Request Number 75052130

For Transmission Service Requested by LG&E Energy Corp.

From LGEE to LGEE

For a Reserved Amount of 750 MW
From 1/1/07 To 12/30/11

Table of Contents

1. Executive Summary

LG&E Energy Corp. has requested a system impact study for MISO OASIS request number 75052130, which is a yearly, firm, network designated request that has a source and sink of LGEE. This request represents the new proposed 750MW of generation at Trimble County, beginning in January of 2007.

The principal objective of this study is to identify constraints on the MISO transmission system, along with adjacent non-MISO transmission systems, that may limit the transfer to less than the total 750 MW that has been requested.

The LGEE to LGEE 750 MW transfer causes overloads on the MISO transmission system. In order to provide the 750 MW of service requested, a facility study must be completed to determine the upgrades necessary to increase the ATC to 750 MW.

2. Introduction

LG&E Energy Corp. has requested a system impact study for MISO OASIS request number 75052130, which is a yearly, firm, network designated request that has a source and sink of LGEE. This request represents the new proposed 750MW of generation at Trimble County, beginning in January of 2007.

The principal objective of this study was to identify constraints on the MISO transmission system, along with adjacent non-MISO transmission systems, that limited the transfer to less than the total 750 MW that has been requested.

This study included steady-state contingency analyses for the requested service period. The steady-state analysis considered the impact of the 750 MW transfer on transmission line loading and transmission bus voltages for outages of single and selected multiple transmission lines and transformers on the MISO and surrounding systems.

3. Study Methodology

A. Description

A 2007 NERC MMWG summer peak model was used to conduct the study. Both peak and shoulder (75-80% of peak) scenarios were analyzed. The shoulder case represented an economic dispatch scenario in which LG&E Energy dispatched all coal-fired units in the Louisville area at or near maximum level, and the coal-fired units at Brown were at minimum level. No CTs were dispatched in this case. All neighboring control areas had their load and generation scaled down in the shoulder case. In both the peak and off-peak case, generation in LGEE and surrounding areas was dispatched economically, based on information that was submitted for this study. In addition, the six CTs located at Trimble County, including the four which are not in service at this time, were included in the base model, and were dispatched at maximum output in the peak model.

All future system (non-generation) projects included in the base model, which were located in the impacted area, were looked at to determine if this transmission service request would be contingent upon them being built. These facilities included:

1. A second 345/230 XFMR at Cayuga located in Cinergy
2. A 161/69 kV XFMR at Victory located between SIGE and HE.
3. Removing the Bedford 345/138 ckt 3 XFMR located in Cinergy.

The MISO solicited input from all TOs in the impacted area to determine any transmission facilities that are included in the models for queued generator interconnection and/or transmission service requests. These were evaluated to determine which were appropriate to include in the base model for this study. This included:

1. Adding the Gilbert #3 generator at the Spurlock bus in EKPC.

All long-term monthly and yearly firm, confirmed reservations were included in the model. This included all long-term reservations that were confirmed and had roll-over rights.

B. CBM and TRM

CBM was applied to the LGEE area by taking Brown #3 out of service (441 MW) and importing this amount of power from Cinergy for the peak model. For the shoulder peak model, Brown #3 was taken off-line, and generation was increased internally based on a dispatch provided by LG&E Energy. TRM is zero for LGEE. CBM and TRM were included in the non-LGEE areas' flowgate analysis.

.

C. Transfer Analysis

This transfer was studied by turning on the new generation at Trimble County and ramping down generation located elsewhere in LGEE, based on a merit order dispatch provided by LG&E Energy. For the contingency analysis, a DC screen against the MISO contingency list and n-1 criteria was performed to isolate the most severe contingencies. MUST was then used to do an AC analysis, using these specified contingencies. For the flowgate analysis, MUST was used to do an AC analysis on the full MISO flowgate list. Because flowgate ratings include CBM and TRM, and a CBM outage scenario was included for LGEE, all flowgates located within LGEE had their CBM value added back into them.

4. Study Results

Tables 1 and 2 located in Appendix A show the initial results of the study using both the peak and off-peak cases. Since the peak results showed the same constrained facilities as the off-peak case with the addition of several others, the task of finding appropriate upgrades was done using only the peak case.
Four different upgrade schemes were used to try to find the best way to relieve the constraints on the transmission system. These four schemes are listed below:

Option 1:
Construct a 345kV line from Trimble County to West Frankfort
Construct a 345kV line from West Frankfort to Brown
Construct a 138kV line from West Lexington to Higby Mill
Construct a 138kV line from West Frankfort to Tyrone
Add a second 345/138 XFMR at Brown

The results from this option are in Appendix A, Table 3. Below is a list of each remaining overloaded facility after the implementation of option 1 .

.

Limiting Circuit
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR
27007 11MIDDLT 345 27119 11MIDDLT 138 3 TR
27014 11W FRNK 345 27151 11W FRNK 138 1 TR
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27091 11FFRT E 138 27140 11SHADRA 138 1 LN
27099 11HARDBG 138 27100 11HARDN 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN
27148 11TYRONE 138 27151 11W FRNK 138 1 LN

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately $90 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately $4 million.

Option 2:
Construct a 345kV line from West Frankfort to Brown
Construct a 345kV line from Mill Creek to Hardin County
Construct a 138kV line from West Lexington to Higby Mill
Reconductor the 138kV line from Hardin County to Etown
Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)
Add a second 345/138 XFMR at Brown

The results from this option are in Appendix A, Table 4. Below is a list of each remaining overloaded facility after the implementation of option 2.

25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27005 11GHENT 345 27014 11W FRNK 345 1 LN
27006 11HARDN 345 27100 11HARDN 138 2 TR
27007 11MIDDLT 345 27013 11TRIMBL 345 2 LN
27007 11MIDDLT 345 27338 11BUCKNR 345 1 LN
27019 11BLUE L 161 29248 20BLIT C 161 1 LN
27075 11CARROL 138 24953 06CLIFTY 138 1 LN
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27085 11ETOWN 138 27124 11NELSON 138 1 LN
27091 11FFRT E 138 27140 11SHADRA 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately $96 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately $4 million.

Option 3:
Loop the existing Ghent (LGEE)-Speed (CIN) 345 kV line through the Trimble County substation.
Construct a 345kV line from West Frankfort to Brown
Construct a 138kV line from West Lexington to Higby Mill
Reconductor the 138kV line from Ghent to Owen County Tap
Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)
Construct a 138 kV line from Ghent to NAS and serve NAS from this line.
Add a second 345/138XFMR at Brown

The results from this option are in Appendix A, Table 5. Below is a list of each remaining overloaded facility after the implementation of option 3.

25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27005 11GHENT 345 27014 11W FRNK 345 1 LN
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR
27015 11W LEXN 345 27153 11W LEXN 138 1 TR
27019 11BLUE L 161 29248 20BLIT C 161 1 LN
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27091 11FFRT E 138 27140 11SHADRA 138 1 LN
27092 11GHENT 138 27120 11MIDWAY 138 1 LN
27099 11HARDBG 138 27100 11HARDN 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN
27137 11RODBRN 138 27336 11SHARKE 138 1 LN

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately $56 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately $4 million.

Option 4:
Loop the existing Ghent (LGEE)-Speed (CIN) 345 kV line through the Trimble County substation.
Construct a 345kV line from Mill Creek to Hardin County
Construct a 138kV line from West Lexington to Higby Mill
Construct a 138 kV line from West Frankfort to Tyrone
Reconductor the 138kV line from Ghent to Owen County Tap
Reconductor the 138kV line from Hardin County to Etown
Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)

The results from this option are in Appendix A, Table 6. Below is a list of each remaining overloaded facility after the implementation of option 4.

25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27006 11HARDN 345 27100 11HARDN 138 2 TR
27014 11W FRNK 345 27151 11W FRNK 138 1 TR
27015 11W LEXN 345 27153 11W LEXN 138 1 TR
27051 11ADAMS 138 27148 11TYRONE 138 1 LN
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27085 11ETOWN 138 27124 11NELSON 138 1 LN
27091 11FFRT E 138 27140 11SHADRA 138 1 LN
27092 11GHENT 138 27120 11MIDWAY 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN
27137 11RODBRN 138 27336 11SHARKE 138 1 LN
27148 11TYRONE 138 27151 11W FRNK 138 1 LN

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately $66 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately $4 million.

5. Conclusion

The request from LGEE to LGEE of 750 MW causes constraints on the MISO transmission system. To provide the 750 MW of service requested, upgrades must be completed for those facilities given in tables 1 through 6, which limit the ATC to 0 MW.

The final cost and assignment of facilities that need to be upgraded will be determined upon the completion of a facility study.

Appendix A. Study Results

Table 1. Off-peak constraints due to additional 750 MW at Trimble County

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
27006 11HARDN 345 27012 11SMITH 345 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	108.4	90.9	334.0	280.1	308.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27064 11BRWN N 138 1	101.6	80.0	485.8	382.6	478.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	105.0	72.6	250.9	173.6	239.0
27053 11AMERI 138 27097 11HAEFLI 138 1 LN	27004 11BRWN N 345 27064 11BRWN N 138 1	144.0	101.4	269.3	189.5	187.0
27053 11AMERI 138 27097 11HAEFLI 138 1 LN	** Base Case **	105.3	80.2	196.9	149.9	187.0
27053 11AMERI 138 27136 11REYNOL 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	106.4	77.0	169.2	122.4	159.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	105.3	71.8	142.2	96.9	135.0
27086 11FARM T 138 27336 11SHARKE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	137.3	93.3	133.2	90.5	97.0
27090 11FLEMIN 138 27093 11GODDRD 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	112.4	93.9	177.5	148.3	158.0
27090 11FLEMIN 138 27157 11WEDONI 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	101.9	85.4	182.3	152.8	179.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	134.5	106.2	181.6	143.3	135.0
27091 11FFRT E 138 27148 11TYRONE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	155.2	106.4	344.6	236.3	222.0
27091 11FFRT E 138 27148 11TYRONE 138 1 LN	27005 11GHENT 345 27015 11W LEXN 345 1	145.3	104.6	322.7	232.3	222.0
27091 11FFRT E 138 27151 11W FRNK 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	126.2	95.7	382.4	290.1	303.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	143.4	107.5	251.0	188.1	175.0
27092 11GHENT 138 27128 11OC TAP 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	117.7	95.0	326.1	263.1	277.0
27105 11KENTON 138 27157 11WEDONI 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	104.5	87.8	187.1	157.2	179.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1	138.4	109.8	186.9	148.2	135.0

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	162.6	109.9	466.8	315.5	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	114.3	91.0	283.5	225.6	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	135.8	101.7	237.7	178.0	175.0
27128 11OC TAP 138 27139 11SCOTT 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	108.1	79.4	299.4	219.9	277.0
27128 11OC TAP 138 27139 11SCOTT 138 1 LN	** Base Case **	101.8	86.2	178.1	150.8	175.0
27132 11PISGAH 138 27153 11W LEXN 138 1 LN	27004 11BRWN N 345 27064 11BRWN N 138 1	126.1	78.8	205.5	128.4	163.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	146.0	100.6	141.6	97.6	97.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
9901:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	248.8	176.0	72.8
2483:Avon - Loudon 138 kV	Base	199.0	251.3	211.3	40

Table 2. Peak constraints due to additional 750 MW at Trimble County

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	110.4	102.0	551.0	508.8	499.0
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	** Base Case **	105.7	97.5	460.8	425.1	436.0
27006 11HARDN 345 27012 11SMITH 345 1 LN	27005 11GHENT 345 27015 11W LEXN 345 1	134.2	78.8	413.3	242.6	308.0
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	114.3	94.0	546.4	449.3	478.0
27012 11SMITH 345 27142 11SMITH 138 1 TR	27005 11GHENT 345 27015 11W LEXN 345 1	113.9	78.1	351.0	240.5	308.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	27005 11GHENT 345 27015 11W LEXN 345 1	108.9	80.8	520.5	386.2	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	118.0	95.3	563.8	455.5	478.0
27019 11BLUE L 161 27003 11BLUELI 345 1 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	128.5	98.0	354.6	270.6	276.0
27019 11BLUE L 161 27003 11BLUELI 345 1 TR	** Base Case **	114.6	96.7	275.0	232.0	240.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	145.8	110.2	348.5	263.4	239.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	** Base Case **	112.1	94.4	268.0	225.7	239.0
27032 11IMBODE 161 27040 11POCK N 161 1 LN	27005 11GHENT 345 27015 11W LEXN 345 1	104.3	71.0	164.8	112.2	158.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	159.7	106.1	154.9	102.9	97.0
27053 11AMERI 138 27097 11HAEFLI 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	147.8	94.3	276.3	176.4	187.0
27075 11CARROL 138 24953 06CLIFTY 138 1 LN	27092 11GHENT 138 27123 11NAS 138 1	108.5	89.3	227.8	187.6	210.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	123.4	74.4	166.6	100.4	135.0
27076 11CENTRF 138 27147 11TRIMBL 138 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	101.5	75.6	218.2	162.6	215.0
27080 11DANVIL 138 27118 11MERCR 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	124.6	75.1	175.7	105.9	141.0
27086 11FARM T 138 27336 11SHARKE 138 1 LN	20SPURLK 345' TO BUS '20AVON 345 20AVON 345' TO BUS '20AVON 138	116.5	80.8	113.0	78.4	97.0
27090 11FLEMIN 138 27093 11GODDRD 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	126.7	94.6	200.2	149.5	158.0
27090 11FLEMIN 138 27157 11WEDONI 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	115.4	86.7	206.6	155.2	179.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	143.9	108.1	194.2	145.9	135.0
27091 11FFRT E 138 27148 11TYRONE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	163.0	88.7	361.8	197.0	222.0
27091 11FFRT E 138 27151 11W FRNK 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	142.8	93.3	432.8	282.6	303.0
	Contin.Description	% Load Post	% Load Pre	Post Trans Cont	Pre Trans Cont Flow	Rating

Limiting Circuit		Trans	Trans	Flow		
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	162.5	100.2	284.3	175.3	175.0
27092 11GHENT 138 27128 11OC TAP 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	137.2	96.3	380.0	266.7	277.0
27092 11GHENT 138 27128 11OC TAP 138 1 LN	** Base Case **	104.5	89.9	237.3	204.2	227.0
27097 11HAEFLI 138 27149 11VILEY 138 1 LN	27097 11HAEFLI 138 27153 11W LEXN 138 1	101.1	88.7	254.8	223.5	252.0
27097 11HAEFLI 138 27153 11W LEXN 138 1 LN	27149 11VILEY 138 27153 11W LEXN 138 1	102.1	90.1	286.0	252.4	280.0
27099 11HARDBG 138 27100 11HARDN 138 1 LN	11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138	121.8	96.0	307.1	242.0	252.0
27105 11KENTON 138 27157 11WEDONI 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	119.0	89.8	213.0	160.7	179.0
27106 11KNOB C 138 27121 11MILL C 138 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	105.1	74.7	207.1	147.2	197.0
27110 11LR TAP 138 27111 11LK REB 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	123.5	79.3	118.5	76.1	96.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	119.8	71.0	161.7	95.9	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	203.4	111.9	583.6	321.1	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	136.0	102.4	337.2	253.9	248.0
27114 11LYNDON 138 27119 11MIDDLT 138 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	111.7	79.3	240.1	170.5	215.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	151.9	93.6	265.8	163.8	175.0
27126 11OHIO C 138 27141 11SHREWS 138 1 LN	27005 11GHENT 345 27015 11W LEXN 345 1	137.0	93.9	226.0	155.0	165.0
27128 11OC TAP 138 27139 11SCOTT 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	123.3	73.9	341.7	204.6	277.0
27128 11OC TAP 138 27139 11SCOTT 138 1 LN	** Base Case **	105.6	82.1	184.8	143.7	175.0
27132 11PISGAH 138 27153 11W LEXN 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	126.1	73.1	205.5	119.1	163.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	20SPURLK 345' TO BUS '20AVON 345 20AVON 345' TO BUS '20AVON 138	126.4	88.4	122.6	85.7	97.0
27141 11SHREWS 138 27337 11MERIDT 138 1 LN	27005 11GHENT 345 27015 11W LEXN 345 1	119.1	78.9	167.9	111.3	141.0
27149 11VILEY 138 27153 11W LEXN 138 1 LN	27097 11HAEFLI 138 27153 11W LEXN 138 1	103.4	91.4	289.4	256.0	280.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
2483:Avon - Loudon 138 kV	Base	199.0	309.7	247.8	61.9
2198:Blue Lick 345/161 XFMR-Baker-Broad	Cont	239.0	277.4	241.0	36.4
2196:Blue Lick 345/161 XFMR	Base	239.0	264.7	227.7	37
9901:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	334.9	264.2	70.7
9902:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	275.4	248.0	27.4
2096:11BLUE L 161 20BLIT C 161 1	Base	239.0	264.7	227.7	37
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	541.2	499.6	41.6
60016:Clifty Creek (OVEC)-Carrollton 138	Base	154.0	162.8	111.6	51.2

Table 3. Results after adding Option 1 to the transmission system

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	101.0	95.7	503.9	477.6	499.0
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR	27007 11MIDDLT 345 27119 11MIDDLT 138 3	105.19	99.73	502.8	476.7	478.0
27007 11MIDDLT 345 27119 11MIDDLT 138 3 TR	27007 11MIDDLT 345 27119 11MIDDLT 138 1	101.76	96.49	486.4	461.2	478.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	27004 11BRWN N 345 27014 11W FRNK 345 O1	104.73	85.54	500.6	408.9	478.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	125.3	100.4	169.2	135.5	135.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	117.0	92.5	157.9	124.9	135.0
27099 11HARDBG 138 27100 11HARDN 138 1 LN	11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138	104.5	92.0	263.3	231.8	252.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	121.6	96.8	164.2	130.7	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	122.2	93.3	350.7	267.7	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	106.3	85.2	263.7	211.3	248.0
27148 11TYRONE 138 27151 11W FRNK 138 1 LN	27004 11BRWN N 345 27014 11W FRNK 345 O1	104.2	73.4	229.2	161.5	220.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
2483:Avon - Loudon 138 kV	Base	199.0	246.4	205.4	41
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	494.4	468.3	26.1

Table 4. Results after adding Option 2 to the transmission system

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	106.6	99.2	531.8	494.9	499.0
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	** Base Case **	102.2	95.1	445.8	414.5	436.0
27005 11GHENT 345 27014 11W FRNK 345 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	100.7	81.4	794.7	641.9	789.0
27006 11HARDN 345 27100 11HARDN 138 2 TR	11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138	109.3	93.4	439.2	375.6	402.0
27007 11MIDDLT 345 27013 11TRIMBL 345 2 LN	27007 11MIDDLT 345 27338 11BUCKNR 345 1	104.2	82.8	1257.4	999.1	1207.0
27007 11MIDDLT 345 27338 11BUCKNR 345 1 LN	27007 11MIDDLT 345 27013 11TRIMBL 345 2	105.8	84.7	1277.4	1022.0	1207.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	27006 11HARDN 345 27008 11MIL CK 345 O2	100.4	86.5	240.0	206.7	239.0
27075 11CARROL 138 24953 06CLIFTY 138 1 LN	27092 11GHENT 138 27123 11NAS 138 1	104.8	87.8	220.2	184.3	210.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	135.1	107.9	182.4	145.7	135.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	27004 11BRWN N 345 27006 11HARDN 345 1	107.1	79.5	160.6	119.2	150.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	126.8	99.9	171.2	134.9	135.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	131.4	104.3	177.5	140.8	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	131.2	98.8	376.6	283.6	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	117.5	92.1	291.5	228.5	248.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
2483:Avon - Loudon 138 kV	Base	199.0	274.7	223.0	51.7
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	522.3	485.8	36.5

Table 5. Results after adding Option 3 to the transmission system

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	104.6	98.9	521.9	493.3	499.0
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	** Base Case **	100.4	94.9	437.9	413.8	436.0
27005 11GHENT 345 27014 11W FRNK 345 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	130.9	100.0	1032.4	789.2	789.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	103.26	85.00	493.6	406.3	478.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	103.1	86.5	246.5	206.7	239.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	151.2	117.9	204.2	159.2	135.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	142.6	109.9	192.5	148.4	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	111.2	82.6	194.7	144.6	175.0
27099 11HARDBG 138 27100 11HARDN 138 1 LN	11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138	110.8	94.8	279.2	238.9	252.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	147.4	114.3	199.0	154.2	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	141.5	104.3	406.2	299.5	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	121.1	95.7	300.3	237.3	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	103.4	76.0	180.9	132.9	175.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	20SPURLK 345' TO BUS '20AVON 345 20AVON 345' TO BUS '20AVON 138	104.0	77.3	100.9	75.0	97.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
2483:Avon - Loudon 138 kV	Base	199.0	280.5	231.8	48.7
2198:Blue Lick 345/161 XFMR-Baker-Broad	Cont	239.0	242.6	216.5	26.1
9901:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	249.0	211.5	37.5
9902:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	243.6	214.8	28.8
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	512.3	484.2	28.1

Table 6. Results after adding Option 4 to the transmission system

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	101.4	96.3	506.2	480.4	499.0
27006 11HARDN 345 27100 11HARDN 138 2 TR	11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138	108.2	92.8	435.0	372.9	402.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	102.85	85.96	491.6	410.9	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	108.56	88.08	518.9	421	478.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN	27064 11BRWN N 138 27148 11TYRONE 138 1	116.1	87.9	112.7	85.3	97.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	140.1	106.9	189.2	144.3	135.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	27004 11BRWN N 345 27006 11HARDN 345 1	107.2	79.2	160.9	118.8	150.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345' '11W FRNK 345' TO BUS '11W FRNK 138'	131.7	99.0	177.8	133.7	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	118.5	87.1	207.3	152.5	175.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1	136.4	103.3	184.2	139.4	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	138.2	99.2	396.6	284.6	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	114.9	89.9	284.9	222.9	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	110.6	80.5	193.5	140.9	175.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	20SPURLK 345' TO BUS '20AVON 345 20AVON 345' TO BUS '20AVON 138	100.4	72.6	97.4	70.4	97.0
27148 11TYRONE 138 27151 11W FRNK 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	112.9	78.5	248.3	172.7	220.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow	delta
2483:Avon - Loudon 138 kV	Base	199.0	265.0	217.0	48
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	496.5	471.1	25.4

Attachment A – Trimble Co. #2 study results (100% output) with Dynergy unit in LGEE at zero output and option 4 upgrades installed

Option 4 - 100% of Trimble Co. #2 (750 MW) dispatched to LGEE

Remaining overloads after option 4 implemented

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	100.8	95.7	503.0	477.5	499.0
27006 11HARDN 345 27100 11HARDN 138 2 TR	C113-T3	107.2	91.5	430.9	367.7	402.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	C114-T3	111.0	88.8	530.5	424.6	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	115.1	91.7	550.1	438.4	478.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN	27064 11BRWN N 138 27148 11TYRONE 138 1	120.3	90.8	116.7	88.1	97.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	C115-T3	142.5	108.2	192.4	146.1	135.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	27004 11BRWN N 345 27006 11HARDN 345 1	107.5	79.2	161.3	118.9	150.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	C115-T3	134.0	100.3	180.9	135.4	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	C114-T3	123.4	89.6	216.0	156.8	175.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	C115-T3	138.7	104.6	187.3	141.2	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	C114-T3	100.1	71.3	306.0	215.9	303.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	C114-T3	115.3	82.9	201.8	145.2	175.0
27148 11TYRONE 138 27151 11W FRNK 138 1 LN	C114-T3	116.3	79.9	255.8	175.7	220.0
FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow		
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	493.4	468.3		

Note: The Buffington 345/138 XFMR for the outage of Pierce/Foster 345 has a flow of 514.5 MVA (103.1%) in the base case without option 4 upgrades and without Trimble Co. #2 turned on. Since the flow on this transformer is less with Trimble Co. #2 turned on and the upgrades for option 4 installed, MISO will ignore this constraint.

The Loudon (LGEE) to Avon (EKPC) tie constraint will need to be mitigated prior to this service being accepted. For this study, it was assumed a 3% reactor was installed at Avon, and the section of line containing 795 ACSR conductor was replaced with 954 ACSR conductor, to raise this line rating to alleviate constraints.

Attachment B – Trimble Co. #2 study results (75% output) with Dynergy unit in LGEE at zero output and option 4 upgrades installed

Option 4 - 75% of Trimble Co. #2 (562 MW) dispatched to LGEE

Remaining overloads after option 4 implemented

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
27006 11HARDN 345 27100 11HARDN 138 2 TR	C113-T3	102.9	91.5	413.8	367.7	402.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	C114-T3	104.2	88.8	498.1	424.6	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	109.1	91.7	521.4	438.4	478.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN	27064 11BRWN N 138 27148 11TYRONE 138 1	111.9	90.8	108.6	88.1	97.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	C115-T3	132.6	108.2	179.0	146.1	135.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	27004 11BRWN N 345 27006 11HARDN 345 1	100.4	79.2	150.6	118.9	150.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	C115-T3	124.2	100.3	167.7	135.4	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	C114-T3	112.7	89.6	197.3	156.8	175.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	C115-T3	128.9	104.6	174.0	141.2	135.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	C114-T3	105.3	82.9	184.3	145.2	175.0
27148 11TYRONE 138 27151 11W FRNK 138 1 LN	C114-T3	104.9	79.9	230.9	175.7	220.0
FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow		
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	487.2	468.3		

Note: The Buffington 345/138 XFMR for the outage of Pierce/Foster 345 has a flow of 514.5 MVA (103.1%) in the base case without option 4 upgrades and without Trimble Co. #2 turned on. Since the flow on this transformer is less with Trimble Co. #2 turned on and the upgrades for option 4 installed, MISO will ignore this constraint.

The Loudon (LGEE) to Avon (EKPC) tie constraint will need to be mitigated prior to this service being accepted. For this study, it was assumed a 3% reactor was installed at Avon, and the section of line containing 795 ACSR conductor was replaced with 954 ACSR conductor, to raise this line rating to alleviate constraints.

Attachment C – Trimble Co. #2 study results (75% output dispatched to LGEE) with Dynergy unit in LGEE at zero output and without upgrades installed.

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
24952 06CLIFTY 345 24953 06CLIFTY 138 1A TR	24952 06CLIFTY 345 24953 06CLIFTY 138 1B	101.7	87.0	196.4	167.9	193.0
24952 06CLIFTY 345 24953 06CLIFTY 138 1B TR	C133-T3	113.6	96.5	176.1	149.6	155.0
24953 06CLIFTY 138 27075 11CARROL 138 1 LN	27092 11GHENT 138 27123 11NAS 138 1	102.9	89.0	216.1	186.8	210.0
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	24962 06PIERC2 345 25981 08FOSTER 345 1	104.8	98.3	522.7	490.5	499.0
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR	** Base Case **	100.2	94.0	437.0	409.9	436.0
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	105.1	90.0	502.6	430.3	478.0
27007 11MIDDLT 345 27119 11MIDDLT 138 2 TR	27007 11MIDDLT 345 27119 11MIDDLT 138 1	109.6	103.1	523.8	493.0	478.0
27007 11MIDDLT 345 27119 11MIDDLT 138 3 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	100.2	85.8	479.0	410.2	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	111.0	94.9	530.8	453.4	478.0
27019 11BLUE L 161 27003 11BLUELI 345 1 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	116.2	92.9	320.8	256.4	276.0
27019 11BLUE L 161 27003 11BLUELI 345 1 TR	** Base Case **	107.7	94.6	258.4	226.9	240.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	131.2	104.5	313.5	249.7	239.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	** Base Case **	105.4	92.4	251.8	220.8	239.0
27053 11AMERI 138 27097 11HAEFLI 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	132.2	94.2	247.2	176.2	187.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	140.0	115.8	189.0	156.4	135.0
27086 11FARM T 138 27336 11SHARKE 138 1 LN	C87-T3	105.1	82.0	101.9	79.5	97.0
27090 11FLEMIN 138 27157 11WEDONI 138 1 LN	C87-T3	104.5	95.0	187.0	170.1	179.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	131.7	107.8	177.9	145.6	135.0
27091 11FFRT E 138 27148 11TYRONE 138 1 LN	C114-T3	120.6	88.0	267.7	195.3	222.0
27091 11FFRT E 138 27151 11W FRNK 138 1 LN	C114-T3	112.0	93.0	339.3	281.7	303.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	C114-T3	124.3	99.8	217.6	174.7	175.0
27092 11GHENT 138 27128 11OC TAP 138 1 LN	C114-T3	110.7	96.1	306.6	266.1	277.0
27099 11HARDBG 138 27100 11HARDN 138 1 LN	C113-T3	110.9	95.9	279.4	241.8	252.0
27105 11KENTON 138 27157 11WEDONI 138 1 LN	C87-T3	107.7	98.2	192.7	175.7	179.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	136.3	112.2	184.0	151.4	135.0

27113 11LOUDON 138 29202 20AVON 138 1 LN	C114-T3	147.0	112.7	421.9	323.5	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	126.5	103.5	313.8	256.8	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	C114-T3	116.9	93.2	204.7	163.2	175.0
27126 11OHIO C 138 27141 11SHREWS 138 1 LN	C114-T3	105.7	93.8	174.4	154.7	165.0
27132 11PISGAH 138 27153 11W LEXN 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	112.8	72.9	183.9	118.8	163.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	C87-T3	113.6	89.6	110.2	86.9	97.0

Attachment C – cont.

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow
2483:Avon - Loudon 138 kV	Base	199.0	299.3	250.8
2198:Blue Lick 345/161 XFMR-Baker-Broad	Cont	239.0	264.2	236.1
2196:Blue Lick 345/161 XFMR	Base	239.0	251.3	222.9
9901:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	308.1	251.0
9902:11BLUE_L_161_20BLIT_C_161_1 for lo	Cont	239.0	273.0	243.1
2096:11BLUE L 161 20BLIT C 161 1	Base	239.0	251.3	222.9
65048:Buffington 345/138 Pierce-Foster 3	Cont	474.0	513.1	481.1
70084:Ghent-Owen County Tap 138 flo Ghen	Cont	277.0	283.4	259.7

Attachment D – Trimble Co. #2 study results (75% output dispatched to LGEE) with Dynergy unit in LGEE at zero output and with only 345kV upgrades installed.

Note: 345kV upgrades include a new line from Mill Creek to Hardin County, and looping Trimble County into the existing Ghent to Speed 345kV line.

Limiting Circuit	Contin.Description	% Load Post Trans	% Load Pre Trans	Post Trans Cont Flow	Pre Trans Cont Flow	Rating
27006 11HARDN 345 27100 11HARDN 138 2 TR	C113-T3	103.6	92.6	416.4	372.2	402.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27004 11BRWN N 345 27015 11W LEXN 345 1	105.1	88.3	502.5	422.1	478.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	27006 11HARDN 345 27008 11MIL CK 345 O3	100.5	89.5	240.3	213.9	239.0
27053 11AMERI 138 27097 11HAEFLI 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	112.9	77.6	211.2	145.1	187.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	27005 11GHENT 345 27014 11W FRNK 345 1	130.2	108.5	175.8	146.4	135.0
27085 11ETOWN 138 27100 11HARDN 138 1 LN	27004 11BRWN N 345 27006 11HARDN 345 1	105.4	90.0	265.7	226.7	252.0
27085 11ETOWN 138 27100 11HARDN 138 1 LN	** Base Case **	112.7	99.9	230.9	204.7	205.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	C111-T3	100.1	83.3	150.2	125.0	150.0
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	C115-T3	122.0	100.5	164.7	135.6	135.0
27091 11FFRT E 138 27151 11W FRNK 138 1 LN	C114-T3	101.6	84.3	308.0	255.6	303.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	C114-T3	110.1	88.4	192.7	154.8	175.0
27092 11GHENT 138 27128 11OC TAP 138 1 LN	C114-T3	102.9	89.8	285.0	248.9	277.0
27097 11HAEFLI 138 27149 11VILEY 138 1 LN	27097 11HAEFLI 138 27153 11W LEXN 138 1	103.6	95.3	261.0	240.2	252.0
27097 11HAEFLI 138 27153 11W LEXN 138 1 LN	27149 11VILEY 138 27153 11W LEXN 138 1	103.8	96.1	290.6	269.0	280.0
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	C115-T3	126.5	104.8	170.8	141.5	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	C114-T3	128.1	102.1	367.7	293.1	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	110.0	92.0	272.7	228.2	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	C114-T3	102.9	81.8	180.0	143.1	175.0
27149 11VILEY 138 27153 11W LEXN 138 1 LN	27097 11HAEFLI 138 27153 11W LEXN 138 1	105.1	97.4	294.4	272.6	280.0

FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow
2483:Avon - Loudon 138 kV	Base	199.0	260.7	222.1

Report

Project G218 (MISO Queue #37356-01) Generation Interconnection Evaluation of a 750 MW Generating Power Plant at Trimble County, KY

Prepared By

Engineering Department
Midwest ISO
701 City Center Dr.
Carmel, IN 46032

March 11, 2003

Table of Contents

Executive Summary

A request for a generation interconnection of a 750 MW generating power plant in Trimble County, KY (Generator) was made to Midwest ISO and was assigned Queue Number 37356-01 and Project Number G218. MISO performed generation interconnection evaluation study with assistance from the Ad Hoc Study Group consisting of members from Cinergy, LGEE and OVEC, and IMEA. The results of this study have been presented in this report.

MISO has recently completed a companion transmission service system impact study (SIS) to evaluate delivery issues as part of MISO OASIS Request Number 75052130. The delivery service SIS study has identified four facility expansion options to alleviate the thermal issues related to the delivery of power from this Generator. A list of these facility expansion options is included in Appendix G of this report.

The generation interconnection evaluation study assumed that the thermal and voltage issues associated with the interconnection of G218 have also been addressed in the system impact study. The system impact study has identified a number of system deficiencies and possible remedies to alleviate system deficiencies. These remedies will be further analyzed in detail in the Facility Study phase of the request under MISO OATT. Therefore, this study did not re-evaluate the single contingency power flow thermal and voltage issues associated with the interconnection of G218.

This study evaluated power system stability, short circuit interruption requirements and potential contingency cascading problems.

Dynamic Stability Analysis – The system remains stable when tested against transmission service SIS study Options 1, 3, and 4 but unstable for Option 2. For facility upgrade Option 2, the Trimble unit becomes unstable for a single pole stuck breaker close-in fault on the Trimble to Clifty 345 KV line with delayed clearing (17 cycles). The critical clearing time for this fault was determined to be 14.5 cycles. This fault condition has not been investigated any further in this evaluation study. It is recommended that this instability condition be reviewed in details in the MISO Facility Study Stage of the MISO Generation Interconnect Request process as outlined in Attachment R of the MISO OATT dated March 29, 2002 if the customer wants to pursue Option 2.

Short Circuit Analysis – The study finds that the addition of the Generator causes an increase in the fault currents seen by a number of breakers in the system. The increased fault currents are expected to be within the breaker current interruption capabilities. Therefore, no breaker replacements are expected to be needed due to the interconnection of this Generator to the system. However, at Clifty Creek 345 kV, duties imposed on at least two circuit breakers are shown to be approaching their nameplate capabilities. Therefore, duties at Clifty Creek will need to be confirmed as part of the facility study.

Cascading Outage Analysis – The study finds that the addition of the Generator did not create any new cascading outage conditions in the system.

1. Introduction

A request for a generation interconnection of a 750 MW generating power plant in Trimble County, KY (Generator) was made to Midwest ISO. The MISO Generation Interconnection Request Queue Number for this request is 37356-01. MISO has performed a generation interconnection evaluation study. The results of this study are presented in this report.

The proposed Generator will be connected to the 345 KV bus at the Trimble substation with an in-service date of January 1, 2007. This generator has requested designation of the generator as network resource. In the Generation Interconnection Evaluation Study Agreement dated June 20, 2002, the request was to "analyze as a 750 MW network resource sinking 1) 100% as LG&E network load or 2) 75% to LG&E network load and 25% to partners outside LG&E control area 12.8% to IMPA and 12.2 % to IMEA". The issue was discussed with the Generator in a meeting on January 8, 2003. It was decided that this study would conform with the assumptions that were made in the system impact study of delivering 100% of the generator output to LG&E control area (MISO OASIS request number 75052130). Therefore this study did not evaluate the second option as indicated in the aforesaid study agreement. Potential system facility upgrades, if any, associated with delivering "75% to LG&E network load and 25% to partners outside LG&E control area 12.8% to IMPA and 12.2 % to IMEA" will be addressed in the Facility Study if desired by the customer to the extent applicable for an interconnection study or as part of the transmission service request when submitted to the MISO OASIS. This study does not address delivery issues and focuses on the issues related to the interconnection of the Generator to the system.

MISO has recently completed a companion transmission service system impact study (SIS) to evaluate delivery issues as part of MISO OASIS Request Number 75052130. The delivery service SIS study has identified four facility expansion options to alleviate the thermal issues related to the delivery of power from this Generator. A list of these facility expansion options is included in Appendix G of this report.

The generation interconnection evaluation study assumed that the thermal and voltage issues associated with the interconnection of G218 have also been addressed in the system impact study. The system impact study has identified a number of system deficiencies and possible remedies to alleviate system deficiencies. These remedies will be further analyzed in detail in the Facility Study phase of the request under MISO OATT. Therefore, this study did not re-evaluate the single contingency power flow thermal and voltage issues associated with the interconnection of G218.

This study evaluated power system stability, short circuit interruption requirements and potential contingency cascading problems. The scope of the study has been defined in the next section.

2. Project Scope

Dynamic Stability Analysis

The purpose of dynamic stability analysis was to assess the ability of the new Generator to remain in synchronism following a system disturbance; assess the adequacy of generator oscillations damping; evaluate the impact of this generator on the dynamic stability of the other generators in the system.

Short Circuit Analysis

The purpose of the short circuit analysis was to assess the ability of the existing circuit beakers to interrupt the new level of fault currents in the system due to the addition Generator.

Cascading Outage Analysis

The purpose of the cascading outage analysis was to identify any new outages that may potentially become a cascading outage for the system.

3. Methodology

Dynamics Stability Analysis – PTI PSSE was used to simulate power system dynamics. The model development for PTI PSSE has been described in the next section. In this study the base system (without the Generator) dynamic performance was compared with the changed system (with the Generator) dynamic performance. The differences in the results were identified and analyzed.

Short Circuit Analysis – PTI PSSE was used to simulate the fault currents at the substations. The model development for PTI PSSE has been described in the next section. The base system (without the Generator) short circuit currents were compared with the changed system (with the Generator) short circuit currents to determine the affect of the new Generator on the fault current. The differences in the results were identified and analyzed.

Cascading Outage Analysis - PTI PSSE was used to identify outages that may potentially lead to cascading outages. The model development for PTI PSSE has been described in the next section. The base system (without the Generator) overloads were compared with the changed system (with the Generator) overloads. The differences in the results were identified and analyzed.

In this analysis, the focus was on identifying the double contingencies that lead to excessive overloading of the transmission facilities.

4. Data Preparation

Dynamic Stability Models

ECAR 2001 series stability model for the 2007 summer peak load was used for this study. The model was updated by including the following items –

- Generators With Signed Interconnection Agreements - Include the generators and their associated facility addition in APPENDIX F. These are the generators in the MISO Interconnection Request Queue that have either a signed Interconnection and Operating Agreement or they did not require an Interconnection and Operating Agreement with the transmission owners to interconnect to the system.
- Generators Higher In MISO Generation Interconnection Request Queue - Include generators that are higher in MISO Interconnection Request Queue. A list of the generators in the queue that is higher in queue than the generator under study has been included in APPENDIX F. In consultation with the affected transmission owners, it was decided that generator at Pike County (Queue number 36441-01) and the 750 MW Thoroughbred generator (Queue number 37077-01) networked into 345 KV and 161 KV systems in LGEE, BREC and TVA area were included in this study. The upgrades associated with Thoroughbred project are listed in APPENDIX F and have been included in the model.
- Updated Line Rating – APPENDIX F lists new line ratings of the existing facilities and have been included in the model.
- Generator Interconnection Options – System Impact Study for MISO Request #75052130 has identified four facility addition options to alleviate any system problems related to the transmission service requests of this Generator. APPENDIX G lists the facility additions associated with each of these four facility addition options. Four models were created to study each one of these four options.

Fault Scenarios

Various faults scenarios were simulated in this study and the affect of these faults on the power system stability was analyzed. A list of all the fault scenarios that were studied is included in APPENDIX B.

Monitored Elements

All the generators and voltages in the Cinergy, LGEE, OVEC, BREC, and EKPC area were monitored. A list of generator angles and voltages that were monitored in this study has been included in APPENDIX H.

Reliability Criteria

The reliability criteria used in the analysis has been included in APPENDIX I.

Positive Sequence Equivalent Fault Admittance Data

Positive sequence equivalent fault admittance data used for simulating single line to ground faults in PSSE application has been included in APPENDIX E.

Short Circuit Model

The short circuit model for this study was created from the ECAR 2000 series short circuit model. This ECAR model was further enhanced by including the following details –

- ECAR model is a year 2000 vintage. This model did not include many generating units in AEP and CIN area that have a signed interconnection agreement. All the generators identified in APPENDIX J were included in the model.
- Add Foster – Bath 345 tie between CIN and DPL
- Delete IPP generators in the ECAR model because they have been either cancelled, withdrawn or delayed – 05Cassad 345 KV; 05Desoto 138 KV; 05Keystn 345 KV units 5-8; machine at buses 1105, 1106
- Add IPP at Hanging Rock
- Add generators identified in "Dynamic Stability Models" section

In the absence of good sequence data for the transmission elements, we have assumed that the positive, negative and zero sequence data of a transformer are same. Also, we have assumed that the zero sequence impedance of a transmission line is 3.5 times greater than the positive sequence impedance. These assumptions are based on industry literature and will be modified as better sequence data become available.

Cascading Outage Analysis

For evaluation of the cascading outage, we have used the load flow part of the models described under section "Dynamic Stability Models".

5. Results and Analysis

MISO has recently completed a companion transmission service system impact study (SIS) to evaluate delivery issues as part of MISO OASIS Request Number 75052130. The delivery service SIS study has identified four facility expansion options to alleviate the thermal issues related to the delivery of power from this Generator. A list of these facility expansion options is included in Appendix G of this report.

The generation interconnection evaluation study assumed that the thermal and voltage issues associated with the interconnection of G218 have also been addressed in the system impact study. The system impact study has identified a number of system deficiencies and possible remedies to alleviate system deficiencies. These remedies will be further analyzed in detail in the Facility Study phase of the request under MISO OATT. Therefore, this study did not re-evaluate the single contingency power flow thermal and voltage issues associated with the interconnection of G218.

This study evaluated power system stability, short circuit interruption requirements and potential contingency cascading problems.

Dynamic Stability Analysis

Results of the dynamic stability simulations have been included in APPENDIX A. The table has been organized by substations. Three phase faults with normal clearing (4 cycles) and single pole stuck breaker faults with delayed clearing (17 cycles) were simulated for this study.

Dynamic Stability Analysis – The system remains stable when tested against transmission service SIS study Options 1, 3, and 4 but unstable for Option 2. For facility upgrade Option 2, the Trimble unit becomes unstable for a single pole stuck breaker close-in fault on the Trimble to Clifty 345 KV line with delayed clearing (17 cycles). The critical clearing time for this fault was determined to be 14.5 cycles. This fault condition has not been investigated any further in this evaluation study. It is recommended that this instability condition be reviewed in details in the MISO Facility Study Stage of the MISO Generation Interconnect Request process as outlined in Attachment R of the MISO OATT dated March 29, 2002 if the customer wants to pursue Option 2.

Short Circuit Analysis

APPENDIX B contains new short circuit fault currents for the four facility addition options identified in the system impact study of this Generator as part of the MISO OASIS Request # 75052130. For each option, there are two tables - one each for a three-phase fault, and a single phase to ground fault. Each table lists the fault currents in the base case and the changed case. The ad hoc group reviewed the increase in the fault

current at the stations due to the addition of the Generator and determined that except at Clifty where duties imposed on at least two circuit breakers are shown to be approaching their nameplate capabilities, the increased level of fault currents are still within the existing breaker fault current interruption capability. Breaker duties at Clifty will need to be confirmed at the facility study.

Cascading Outage Analysis

A summary of the results of the cascading outage analysis has been included in APPENDIX C. There are a total of 7 contingencies in the base case (without Generator) that lead to violations in the system. A violation was defined as an overload that met the following criteria –

- Greater than 130% overload on a transmission line or a transformer; emergency rating was considered for the contingency case
- Change in flow of 20 MW or more between the base case and the contingency case
- Contingency Elements - double contingencies of all transmission lines and transformers 230 KV and above in CIN, LGEE, and OVEC, EKPC, BREC control areas
- Monitored Elements – Monitor all branches 230 KV and above in CIN, LGEE, and OVEC, EKPC, BREC control areas

The changed case (with Generator) for Option 1, Option 2, Option 3, Option 4 gave rise to an additional 2, 0, 3, 2 contingencies respectively that lead to thermal overloading. Since we are interested in the affect of the new generators on the cascading outages, we did not analyze the base case contingencies that gave rise to overloads. This study has focused on the incremental changes due to the new Generator. The new overloads are in the Kokomo, and Lafayette area in Indiana. These areas are electrically separated from Trimble area in Kentucky where the proposed generation has been added and could not possibly be affected by the addition of the new Generator. Further investigation into these overloads show that in the base case (without the new Generator) the overloading in the Kokomo and Lafayette area was marginal with respect to the 130% overload cutoff limit, and therefore, these overloads did not make the list of overloading facilities. However, due to the topology changes with the addition of the Generator, there was an increase of one-megawatt flow on the elements in the Kokomo and Lafayette area that caused these contingencies to make the list of overloads. The purpose of this effort was to identify contingencies leading to excessive overload that may potentially lead to cascading outages. The overloads identified in the Kokomo and Lafayette area are not considered excessive overloads due to the Generator, and therefore, does not warrant further investigations. Therefore, the study concludes that no new cascading outages have been created due to the addition of the Generator.
As part of this study, we have also investigated simultaneous outage of a generator and a transmission line in the LGEE area. The assumptions were made for this analysis –

- Monitored Elements – Monitor all branches 230 KV and above in CIN, LGEE, and OVEC, EKPC, BREC control areas
- Contingency Elements- single contingencies of all transmission lines and transformers 230 KV and above in LGEE control area
- Violation – overload of greater than100% of the emergency rating
- PTI MUST was used for this analysis; the loss of generation was picked up by the rest of the generators in the CIN, LGEE and OVEC, EKPC, BREC control areas

A summary of the results has been included in APPENDIX D. The first column of this table lists the location of the generator in the LGEE area. The next 5 columns include the maximum MW generation loss for which no thermal overload was found for the loss of a transmission line or a transformer in the contingency list. The entry of "No Problem" indicates that the loss of the biggest generator at each location considered in combination with a single contingency did not cause any violations in the system. The study finds that at Mill Creek generating station, only a loss of 250 MW of generation could be sustained without overloading 345 KV transmission line from Middletown to Buckner and Middletown to Trimble. Once this limitation has been eliminated, the system will be able to sustain the loss of the biggest generating plant at Mill Creek in combination with the critical contingency without any violation.

6. Conclusions

Dynamic Stability Analysis – The system remains stable when tested against transmission service SIS study Options 1, 3, and 4 but unstable for Option 2. For facility upgrade Option 2, the Trimble unit becomes unstable for a single pole stuck breaker close-in fault on the Trimble to Clifty 345 KV line with delayed clearing (17 cycles). The critical clearing time for this fault was determined to be 14.5 cycles. This fault condition has not been investigated any further in this evaluation study. It is recommended that this instability condition be reviewed in details in the MISO Facility Study Stage of the MISO Generation Interconnect Request process as outlined in Attachment R of the MISO OATT dated March 29, 2002 if the customer wants to pursue Option 2.

Short Circuit Analysis – The study finds that the addition of the Generator causes an increase in the fault currents seen by a number of breakers in the system. The increased fault currents are expected to be within the breaker current interruption capabilities. Therefore, no breaker replacements are expected to be needed due to the interconnection of this Generator to the system. However, at Clifty Creek 345 kV, duties imposed on at least two circuit breakers are shown to be approaching their nameplate capabilities. Therefore, duties at Clifty Creek will need to be confirmed as part of the facility study.

Cascading Outage Analysis – The study finds that the addition of the Generator did not create any new cascading outages in the system.

Glossary of Terms

Generator – 750 MW generating power plant in Trimble County

Facility Study Report

Project F012 (MISO OASIS #75052130)
750 MW LGEE.TrimbleCty to LGEE

Prepared By

Engineering Department
Midwest ISO
701 City Center Dr.
Carmel, IN 46032

July 15, 2003

Table of Contents

Executive Summary

A facility study request for transmission service in the amount of 750 MW from a generating power plant in Trimble County, KY in LGEE to LGEE was made to Midwest ISO. The MISO Transmission Service Request Number for this request is 75052130. This project is also known as Project F012. MISO has coordinated the Delivery Facility Study (the "Study") for this project and the results of the study are presented in this report.

The earlier system impact study on the delivery of power from this generator (see system impact study report on project A024 for request # 75052130 posted on MISO OASIS) has revealed that there were multiple system deficiencies. Four facility upgrade options were identified to alleviate system network problems. After further review, LGEE Transmission chose Option #4 as the preferred option. Facility upgrades related to this option have been included in this report.

The facility upgrades related to Option #4 were further split into facilities to be included in the generation interconnection study and in the delivery study. Looping of the Ghent – Speed 345 KV line through the Trimble 345 KV substation will be included as part of the generation interconnection request. The remaining facility upgrades are addressed in this delivery service request.

The total cost of upgrades/additions required for delivery of the proposed generation to LGEE has been estimated to be $65,523,351 in 2003 dollars. This estimate does not include the looping of the Ghent – Speed 345 KV line through the Trimble 345 KV substation, but it assumes that the work is being completed under the generation interconnection request.

None of the costs identified in this report are eligible for credits.

The study has identified the key events and the schedule for those events in order to achieve a start date of January 1, 2007. The lead-time for line work related to looping of the Speed – Ghent 345 KV line through Trimble 345 KV substation has been identified as one of the longest, and must start around October 1, 2003 in order to meet the deadline. This is discussed in more detail in the generation interconnection report. A schedule of key tasks for the transmission owners for the other upgrades/installations has been prepared and included in this report.

1. Introduction

A facility study request for transmission service in the amount of 750 MW from a generating power plant in Trimble County, KY in LGEE to LGEE was made to Midwest ISO. The MISO Transmission Service Request Number for this request is 75052130. This project is also known as Project F012. MISO has coordinated the Delivery Facility Study (the "Study") for this project and the results of the study are presented in this report.

An earlier system impact study on the delivery of power from this generator (see system impact study report on project A024 for request # 75052130 posted on MISO OASIS) has revealed that there were multiple system deficiencies. Four facility upgrade options were identified to alleviate system network problems. After further review, LGEE Transmission chose Option #4 as the preferred option.

The facility upgrades related to option 4 are given below –

Loop the existing Ghent (LGEE)-Speed (CIN) 345 kV line through the Trimble County substation. (covered in the generation interconnection study)
Construct a 345kV line from Mill Creek to Hardin County
Construct a 138kV line from West Lexington to Higby Mill
Construct a 138 kV line from West Frankfort to Tyrone
Re-conductor the 138kV line from Ghent to Owen County Tap
Re-conductor the 138kV line from Hardin County to Etown
Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)

The above upgrades do not alleviate all the system overload problems. Below is a list of the remaining overloaded facilities after the implementation of option 4 along with the LGEE identified mitigation rationale:

Bus Name		Bus Name		New Ratings	Comments
11HARDN 345	TO	11HARDN 138	2	450/478	This is a new transformer scheduled to be installed in 2005.
11W FRNK 345	TO	11W FRNK 138	1	448/515	Transformer CT ratio will be reset and the low-side breaker will be replaced. Costs have been provided for this.
11W LEXN 345	TO	11W LEXN 138	1	448/478	Ratings are unchanged. The critical contingency is not valid per LGEE planning criteria.
11ADAMS 138	TO	11TYRONE 138	1	119/119	Ratings have been revised as listed.

11CARROL 138	TO	11LOCKPO 138	1	191/191	The operating limit of the conductor has been increased, and the cost to replace 600A disconnects at Carrollton have been provided.
11ETOWN 138	TO	11NELSON 138	1	202/224	The operating limit of the conductor has been increased.
11FFRT E 138	TO	11SHADRA 138	1	191/191	The operating limit of the conductor has been increased.
11GHENT 138	TO	11MIDWAY 138	1	202/224	The operating limit of the conductor has been increased.
11LOCKPO 138	TO	11SHADRA 138	1	224/224	The operating limit of the conductor has been increased.
11LOUDON 138	TO	20AVON 138	1	224/277	Ratings are unchanged. A joint study with EKPC related to the Gilbert #3 unit addition has identified installation of a 4% reactor at Avon as the solution.
11MIDWAY 138	TO	11W LEXN 138	1	202/224	The operating limit of the conductor has been increased.
11TYRONE 138	TO	11W FRNK 138	1	224/277	Conductor size of this future line has been increased.

The facility study was split into two separate studies. One related to the generation interconnection request and the other one related to the delivery request. This report covers the facility study related to the delivery request.

The looping of Ghent-Speed 345 KV line through the Trimble Co. 345 KV substation was included in the generator interconnection study, since it is the only facility required to satisfy generation interconnection criteria. The remaining facility upgrades have been addressed as part of this delivery request #75052130.

2. Assumptions

- **Start date**
  The start date for this service is January 1, 2007.
- **Testing Period**
  As informed by the developer, the testing period will be 6-months. All the electrical work on the transmission owners system must be ready by July 1, 2006.
- **Dollar conversion from one year to another**

All dollar figures are year end 2003 dollars. Dollar conversion rate for LG&E Energy from one year to the other has been assumed to be = 3.3% per year

- **Substation Equipment Procurement and Construction**
  Procurement of substation equipment and substation construction will start 12 months before the generator in-service date.
- **10% Markup**
  A 10% cost markup has been applied to all estimates.

3. Construction Cost and Schedule

For detailed substation estimates, see Attachment 1.
For detailed line estimates, see Attachment 2.
For detailed line schedules, see Attachment 3.

4. Summary of Total Cost and Schedule

Task	Cost in 2003 Dollars	Cost in 2007 Dollars
Mill Creek 345 kV Terminal Addition	$515,874	$587,415
Mill Creek to Hardin Co 345 kV line	$46,558,308	$53,014,965
Hardin Co 345 kV Terminal Addition	$398,666	$453,953
Tyrone 138 kV Terminal Addition	$442,790	$504,196
Tyrone to West Frankfort 138 kV line	$6,261,750	$7,130,123
West Frankfort 138 kV Terminal Addition	$783,156	$891,763
Higby Mill 138 kV Terminal Addition	$234,502	$267,022
Higby Mill to West Lexington 138 kV line	$1,713,640	$1,951,286
West Lexington 138 kV Terminal Addition	$276,763	$315,144
Reconductor Ghent to Owen Co 138 kV line	$1,847,476	$2,103,682
Elizabethtown 138 kV Terminal Addition	$13,252	$15,090
Reconductor Elizabethtown to Hardin Co 138	$488,586	$556,343
Carrollton Terminal Upgrade	$31,920	$36,347
Total	$59,566,683	$67,827,327
10% Markup	$5,956,668	$6,782,733
Grand Total	$65,523,351	$74,610,060

The generator requires that the work on the TO side related only to looping the Ghent-Speed 345 kV line through the Trimble County substation to be completed 6 months before the commercial operation date of January 1, 2007. All the transmission work related to the delivery request is not required until the beginning of the network service period (presently identified as January 1, 2007). Based on the individual schedules for tasks at the substations and the line work that has been presented in Section 3 of this report, the following schedule for key tasks has been prepared.

Start Date	Task/Item
30-Jun-03	Mill Creek - Hardin County Engineering Design
12-Jan-04	Mill Creek - Hardin County Right-of-Way work
5-Mar-04	Tyrone - West Frankfort Engineering Design
15-Oct-04	Tyrone - West Frankfort Right-of-Way work

30-May-05	Mill Creek - Hardin County Material Acquisition
30-May-05	Mill Creek - Hardin County Line Construction
1-Jul-05	Order all substation materials
1-Jul-05	Substation Construction Work
22-Jul-05	Tyrone - West Frankfort Material Acquisition
3-Mar-06	Tyrone - West Frankfort Line Construction

5. Review and Analysis of Delivery Evaluation Study

The purpose of this review and analysis is to adequately address all the concerns that were raised in the system impact study and establish that the new facility upgrades will work and will not deteriorate the system.

The Option 4 facilities detailed in the cost estimates above along with the subsequent modeling information provided by the TO (as well as those in Generation Interconnection Facility Report G218) were found to mitigate all constraints identified in the system impact study A024 and did not create any new limitations on the system.

6. Conclusions

The total cost of upgrades/additions required for delivery of the proposed generation to LGEE has been estimated to be $65,523,351 in 2003 dollars. This estimate does not include the looping of the Ghent – Speed 345 KV line through the Trimble 345 KV substation, but it assumes that the work is being completed under the generation interconnection request.

None of the costs identified in this report are eligible for credits.

The study has identified the key events and the schedule for those events in order to achieve a start date of January 1, 2007. The lead-time for line work related to looping of the Speed – Ghent 345 KV line through the Trimble 345 KV substation has been identified as one of the longest, and must start around October 1, 2003 in order to meet the deadline. This is discussed in more detail in the generation interconnection report. A schedule of key tasks for the transmission owners for the other upgrades/installations has been prepared and included in this report.

Attachment 1 – Substation Cost Estimates From LGEE

See File "From LGEE - Substation Estimates and Drawings.tif"

Attachment 2 – Line Cost Estimates From LGEE

See File "From LGEE - Line Estimates.doc"

Attachment 3 – Line Schedules From LGEE

See File "TyroneWFrank.pdf"

See File "MillCreekHardinCounty.doc"

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF TRANSMISSION FACILITIES IN TRIMBLE COUNTY, KENTUCKY	)	CASE NO. 2005-00155

DIRECT TESTIMONY OF
J. NATE MULLINS
MANAGER, TRANSMISSION LINE SERVICES
LG&E ENERGY SERVICES INC.

Filed: May 11, 2005

Q. Please state your name, position, and business address.

A. My name is J. Nate Mullins. I am Manager, Transmission Line Services, for LG&E Energy Services Inc. on behalf of Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively "the Companies"). My business address is One Quality Street, Lexington, Kentucky 40507. My background and work experience are described in Appendix A.

Q. Are you sponsoring any exhibits?

A. Yes. I will be sponsoring the following exhibits:

Exhibit JNM-1, Route Map;

Exhibit JNM-2, Sketches of proposed typical transmission line support structures; and

Exhibit JNM-3, Alternative Route Maps.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the route of the transmission line for which LG&E is seeking a certificate of public convenience and necessity in this proceeding. My testimony also provides the information required by the Commission's administrative regulations relating to the routes chosen, the support structures to be used, and a demonstration why the construction of the proposed transmission line serves the public convenience.

Q. Please describe the transmission line LG&E proposes to construct in this proceeding.

A. LG&E has proposed the construction of a 345 kV transmission line, approximately 2.5 miles in length (of which, approximately 0.8 miles is located in Kentucky and approximately 1.7 miles is located in Indiana). The line runs from

the proposed 750 MW nominal net (732 MW summer rating) supercritical pulverized coal fired base load generating unit to be located at the Trimble County Generating Station ("TC2") across the Ohio River to interconnect with an existing 345 kV transmission line near Marble Hill, Indiana, and depicted on Exhibit JNM-1.

Q. Please describe how the maps that are designated Exhibit JNM-1 and Exhibit JNM-3 were prepared.

A. The Companies engaged Photo Science Geospatial Solutions to assist them in selecting the route for this line. Exhibit JNM-1 was prepared by Photo Science. The map was prepared after the Companies and Photo Science had analyzed potential routes for the line and determined that the route shown on the map is a reasonable route and location for the lines. Exhibit JNM-3 was also prepared by Photo Science and shows the alternative route that was considered. The maps were made by persons acting under my direction and supervision and are an accurate depiction of the route we have selected and the alternative route.

Q. Has LG&E determined the type of transmission structures that will be utilized in the construction of these lines?

A. Yes. Exhibit JNM-2 is a sketch of the type(s) of structures that we anticipate using on this project. This sketch was made by persons acting under my direction and supervision and is an accurate depiction of the structures.

Q. Please describe how this transmission line will be constructed.

A. Beginning in the fourth quarter of 2005, the Companies will start environmental and cultural studies and related surveys in areas where we have obtained survey

permission, as part of the easement acquisition process. These surveys will be performed by Photo Science and are scheduled to be completed by mid-2006.

After the CCN has been issued for this project, the Companies will begin the easement acquisition, right-of-way vegetation removal, final design, material acquisition and construction phases of the project. Once the easements have been obtained for the new route and the cultural and environmental surveys have been completed, the vegetation will be cleared in these areas.

The transmission line design engineering functions for this project will be performed by the Companies' Transmission Line Services personnel located at One Quality Street in Lexington. The Companies will request qualified vendors to submit competitive bids for the material required for the completion of the work. Qualified contractors will be requested to competitively bid on the transmission line construction. The requests for bids will specify that all work performed shall comply with all local, state and federal laws and conform to all permits and environmental requirements.

Q. What is the expected cost of construction for the transmission line?

A. The estimated cost is approximately $7.2 million.

Q. Please describe generally how the route for the transmission line was selected.

A. After examining the load analysis performed by Midwest Independent Transmission System Operator, Inc., as described in Mr. Johnson's testimony, the Companies were able to identify the portions of our existing transmission system that would not be sufficient to provide the transmission power required. The result of the process was the identification of the areas in which transmission line

added, rather than merely upgraded. Those areas are (i) between LG&E's Mill Creek Substation and KU's Hardin County Substation, (ii) from TC2 to the Public Service Indiana 345 kV transmission line near Marble Hill, Indiana, and (iii) from KU's Tyrone Substation to KU's West Frankfort Substation.

Q. Once the Companies determined the general areas where new transmission lines should be constructed, what criteria were utilized in the selection of the specific routes?

A. The routes of the transmission lines are designed to serve the projected load at a reasonable cost with as little impact as can be reasonably afforded. The final routes were determined after evaluating the topography and geology along the routes considered and adjusting the routes as appropriate, consistent with sound engineering principles and keeping in mind the desire to utilize the least cost options. The routes are designed to mitigate impacts to existing property improvements, developments and known uses of the land. Thus, the routes for the lines are designed to provide the needed facilities to serve the projected load at a reasonable cost while minimizing the impacts of the projects. With consideration for engineering constraints, alternative routes were identified maximizing the use of existing utility corridors and minimizing the impacts on people and the natural environment.

Once the route alternatives were identified, they were evaluated according to the Electric Power Research Institute ("EPRI") Standardized Method of Siting Overhead Transmission Lines. The EPRI methodology was used to statistically compare route alternatives based on their relative impacts to the built environment, including relocating residences, proximity to residences, proposed

developments, proximity to commercial and industrial buildings, schools, day care centers, churches, cemeteries and parks; relative impacts to the natural environment including natural forests, stream and river crossings, wetlands, and flood plains; and engineering criteria including miles of rebuild of existing transmission lines, miles of co-location with existing utilities and roads, and total project cost. The resulting preferred route balances impacts to people, the natural environment and cost.

Q. Please describe how the route for the Trimble County Line was selected.

A. Utilizing the best available maps, aerial photographs and ancillary data, two (2) alternative routes were identified. Aerial photography was used to map built, environmental, and engineering constraints in proximity to the alternative routes. Route alternatives were also evaluated from helicopter. Detailed cost estimates were completed for the alternatives and they were compared using the EPRI siting methodology. The resulting preferred route balances impacts to people, the natural environment and cost. Aerial surveys were performed along the preferred route to create detailed planemetric and topographic maps and aerial photography. County property valuation administrator's data was used to identify property lines along the preferred route. Based on these detailed maps and ancillary data, the preferred route was chosen as the optimum route as recommended by utilizing the EPRI siting methodology.

Q. Please describe the factors that led LG&E to select the route that it did for the Trimble County Line.

A. Two alternative tap points were identified on the existing transmission line in Indiana, west of the Trimble County Plant. Major constraints include the entrance

into the Trimble County Plant property and the Ohio River crossing. The southern route, or route A, is preferred because it minimizes impacts to the built and natural environments and is the least cost alternative.

Q. Did LG&E hold any meetings to make the public aware of the plans to construct the transmission lines and to receive comments from interested participants?

A. Yes. On April 28, 2005, LG&E held a public information meeting at Trimble County High School in Bedford.

Q. Do you have a recommendation for the Commission in this case?

A. Yes. I recommend that the Commission find that the proposed construction will serve the public convenience and that the route selected for the transmission line is reasonable and appropriate. Further, I recommend that the Commission provide flexibility in any orders approving the proposed construction for LG&E to make unsubstantial modifications to the route chosen if conditions justify or compel such modifications without the need for further orders from the Commission.

Q. Does this conclude your testimony at this time?

A. Yes

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **J. Nate Mullins**, being duly sworn, deposes and says he is the Manager, Transmission Line Services for LG&E Energy Services, Inc., that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

J. NATE MULLINS

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 10th day of May 2005.

Notary Public

My Commission Expires:

VICTORIA B. HARPER
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY
My Commission Expires Sept. 20, 2006

Appendix A

J. Nate Mullins

Manager, Transmission Line Services
LG&E Energy Services, Inc.
One Quality Street
Lexington, Kentucky 40507

Education

University of Kentucky, B.S. in Civil Engineering - 1977
Licensed Professional Engineer
Licensed Professional Land Surveyor

Previous Positions

Kentucky Utilities Company
Manager, Transmission Line Services, 1986-1997
Supervisor, Project Engineering, Transmission Line Department, 1979-1986
Project Engineer, Transmission Line Department, 1977-1979

Other Professional Associations

East Central Area Reliability (ECAR) Region
Transmission Facilities Panel Member (Chair 3 years)