



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

RECEIVED

MAY 11 2005

PUBLIC SERVICE  
COMMISSION

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

**RE: Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity for the Construction of Transmission Facilities in Franklin, Woodford and Anderson Counties, Kentucky - Case No. 2005-00154**

Dear Ms. O'Donnell:

Enclosed please find an original and ten (10) copies of Kentucky Utilities Company's ("KU") 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

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



COMMONWEALTH OF KENTUCKY  
BEFORE THE PUBLIC SERVICE COMMISSION

RECEIVED

MAY 11 2005

PUBLIC SERVICE  
COMMISSION

In the Matter of:

APPLICATION OF KENTUCKY UTILITIES )  
COMPANY FOR A CERTIFICATE OF PUBLIC )  
CONVENIENCE AND NECESSITY FOR THE )  
CONSTRUCTION OF TRANSMISSION )  
FACILITIES IN FRANKLIN, WOODFORD )  
AND ANDERSON COUNTIES, KENTUCKY )

CASE NO.  
2005-00154

\* \* \* \* \*

APPLICATION

Kentucky Utilities Company ("KU"), 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 Franklin, Woodford and Anderson Counties, Kentucky. In support of this Application, KU states as follows:

1. Address. KU's full name and business address is Kentucky Utilities Company, One Quality Street, Lexington, Kentucky 40507. KU's mailing address is P.O. Box 32010, Louisville, Kentucky 40232.

2. Articles of Incorporation. Certified copies of KU'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. KU seeks a certificate of public convenience and necessity to construct a 138 kV transmission line, approximately 12.4 miles in length, running from KU's Tyrone Substation in Woodford County through Anderson and Franklin County to KU's West Frankfort Substation. KU will own 100% of the proposed transmission line. 807 KAR 5:001, Section 9(2)(c).

4. Notice of Intent. KU 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 required by the projected load that will be served 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") as well as base load that will be served from other sources. 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 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 line is designed to mitigate impacts to existing property improvements, developments and known uses of the land. Thus, the route for the line is designed to provide the needed facilities to serve the projected load while

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. KU 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. KU 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 KU to maintain its strong investment-grade credit ratings. KU 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 \$45,000 to \$47,000 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 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.

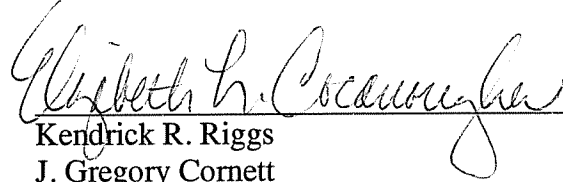
13. Newspaper Notice. Notices of the intent to construct the proposed transmission lines have been published in newspapers of general circulation in Franklin, Woodford and Anderson Counties, Kentucky, which notices included the information set forth in 807 KAR 5:120, Section 2(5). Copies of the newspaper notices 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 KU. 807 KAR 5:120, Section 2(7).

**WHEREFORE,** Kentucky Utilities Company respectfully requests the Commission to issue an order granting it a certificate of public convenience and necessity for the construction of a 138 kV transmission line in Franklin, Anderson and Woodford Counties, 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 Kentucky Utilities Company

VERIFICATION

COMMONWEALTH OF KENTUCKY )  
 ) SS:  
COUNTY OF JEFFERSON )

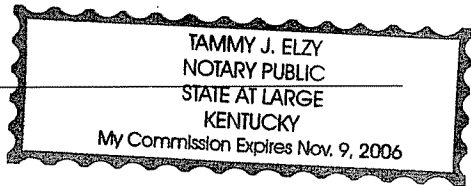
The undersigned, **Kent W. Blake**, being duly sworn, deposes and says he is Director of State Regulation and Rates for LG&E Energy Services Inc., on behalf of Kentucky Utilities Company, hereby states that he has read the foregoing Application and that the statements contained therein are true and correct 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 11<sup>th</sup> day of May 2005.

*Tammy J. Elzy*  
\_\_\_\_\_  
NOTARY PUBLIC

My commission expires: \_\_\_\_\_









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

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

Case 2005-00154

RECEIVED

APR 11 2005

PUBLIC SERVICE  
COMMISSION

RE: In the Matter of: Application of Kentucky Utilities Company for the Construction of Transmission Facilities in Franklin, Woodford and Anderson Counties, Kentucky

Dear Ms. O'Donnell:

Please take notice that, pursuant to KRS 278.020 and 807 KAR 5:120, Kentucky Utilities 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 138 kV transmission line in portions of Franklin, Woodford and Anderson Counties in Kentucky. Specifically, that proposed line will run from the West Frankfort Substation in Franklin County to the Tyrone Substation in Woodford County. 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

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 138,000 volt electric transmission line from our West Frankfort substation in Franklin County to our Tyrone generating station in Woodford County. 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 2005-00154. 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

[property owner (per PVA)]  
[Date]  
Page 2

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 2005-00154);
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](http://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. \_\_\_\_\_]:

Kentucky Utilities Company (KU) plans on constructing a 138,000 volt electric transmission line from our West Frankfort substation in Franklin County to our Tyrone generating station in Woodford County. 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.

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 2005-00142. If the Commission does approve construction of the line, KU will build a portion of the line on the utility easement that already crosses your property.

In order to provide information to you and the owners of other properties that would be crossed by the planned line, KU will hold a public information session at Robert B. Turner Elementary School located at 1411 Fox Creek Road in Lawrenceburg on Tuesday, April 26, 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](http://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.

[property owner (per PVA)]  
[Date]  
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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 Robert B. Turner Elementary School in Lawrenceburg on Tuesday, April 26, 2005 from 6:00 p.m. to 8:00 p.m. to learn more about the project.

Sincerely,

Mark S. Johnson  
Director - Transmission

[Date]

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

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[property owner (per PVA)]  
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Mark S. Johnson  
Director - Transmission

## REVISED NOTICE

[Date]

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

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Public Service Commission  
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P.O. Box 615  
Frankfort, Kentucky 40602

[property owner (per PVA)]

[Date]

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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
Florida Tile Industries, Inc.		One Sikes Blvd		Lakeland	FL	33802
Vinning	Thomas & Hazel	1201 Alton Station Rd		Lawrenceburg	KY	40342
Abbott	James & Dana	509 Pawnee Tr		Frankfort	KY	40601
Blackburn	Charles & Janice	1721 Old Frankfort Rd		Lawrenceburg	KY	40342
Hughes	Jerry & Lisa	1689 Graefenburg Rd		Lawrenceburg	KY	40342
Monohan	Dennis & Patricia	1775 Graefenburg Rd		Lawrenceburg	KY	40342
Mountjoy	David & Ellen	1825 Graefenburg Rd		Lawrenceburg	KY	40342
Hall	Harold & Helen	1778 Graefenburg Rd		Lawrenceburg	KY	40342
Damaby	Harold & Linda	1864 Graefenburg Rd		Lawrenceburg	KY	40342
Disponett	Christopher & Leigh	111 Beth Dr		Lawrenceburg	KY	40342
Green	David & Faye	1952 Graefenburg Rd		Lawrenceburg	KY	40342
Smith	James & Sandra	1984 Graefenburg Rd		Lawrenceburg	KY	40342
Haden	Alice	600 Main St		Lawrenceburg	KY	40342
Merchant	Van & Anne	308 Stonehedge St		Frankfort	KY	40601
Smith	James	1984 Graefenburg Rd		Lawrenceburg	KY	40342
Green	Michael	3556 Highway 151		Frankfort	KY	40601
Green	James & Donna	3560 Highway 151		Frankfort	KY	40601
Spencer	John & Judith	1439 Old Seven Mile Rd		Shelbyville	KY	40065
Dempsey	Ronald & Patsey	1185 South Benson Rd		Frankfort	KY	40601
Smith	Odell	1240 South Benson Rd		Frankfort	KY	40601
Bryant	Larry & Brenda	2888 Elmburg Rd		Shelbyville	KY	40065
Pulliam, Jr.	Ronald	1285 Evergreen Rd		Frankfort	KY	40601
Downs [1]	Joseph	1009 North 3rd St		Bardstown	KY	40004
Harrod	Edmond & Carol	645 Evergreen Rd		Frankfort	KY	40601
Wilson	June & Betty	490 South Benson Rd		Frankfort	KY	40601
Hearn	Hobart & Anna Elizabeth	300 Browns Ln		Frankfort	KY	40601
Smith	Clyde	365 Evergreen Rd		Frankfort	KY	40601
Morris	R. Wayne & Wanda	1285 Bridgeport Rd		Frankfort	KY	40601
Brewer	Michael & Lisa	2039 Hampstead Ln		Frankfort	KY	40601

## Tyrone to W Frankfort New Easement Mailing List

[1] Joseph Downs purchased Ms. Barbara Reynolds property since the original letter were sent. A revised notice letter dated May 9, 2005 was mailed to Mr. Downs at 1009 N 3rd St, Bardstown, KY 40004

**Tyrone to Frankfort  
Existing Easement Mailing List**

Name One		Name Two		Address One		Address Two		City	State	Zip
Crawford		Jerry and Sallie		101 Suzanne Dr		Lawrenceburg		Lawrenceburg	KY	40342
Austin Nichols & Co., Inc.				Post Office Box 180		Lawrenceburg		Lawrenceburg	KY	40342
Corn		Maurice		1329 Versailles Rd		Lawrenceburg		Lawrenceburg	KY	40342
Wooton		Earl		102 Green View Ave		Lawrenceburg		Lawrenceburg	KY	40342
Dearinger		Orville & Frances		1473 Alton Station Rd		Lawrenceburg		Lawrenceburg	KY	40342
Clark		Pauline		1307 Versailles Rd		Lawrenceburg		Lawrenceburg	KY	40342
Green		Della Mae		1024 Lock Rd		Lawrenceburg		Lawrenceburg	KY	40342
Wellman		Billy & Betty		1068 Macland Rd		Lawrenceburg		Lawrenceburg	KY	40342
Dezarn		Robert & Juliane		Post Office Box 227		Lawrenceburg		Lawrenceburg	KY	40342
Hyatt, Jr.		Vernon		121 Cardinal Dr		Lawrenceburg		Lawrenceburg	KY	40342
Hyatt		Bobby Allen & Sue		1188 Jenny Lillard Rd		Lawrenceburg		Lawrenceburg	KY	40342
Stallard		William & Joanna		9301 Springdale Dr		Raleigh		Raleigh	NC	27613
Best		Charles Thomas & Burlita		1200 Jenny Lillard Rd		Lawrenceburg		Lawrenceburg	KY	40342
Hawkins		John & Dana		1049 Woolridge Ln		Lawrenceburg		Lawrenceburg	KY	40342
BPS Development, Inc.				154 S Main St		Lawrenceburg		Lawrenceburg	KY	40342
Major, Jr.		Walter		812 N Main St		Lawrenceburg		Lawrenceburg	KY	40342
Smith		Kerry & Tamara		1224 Melanie Ct		Lawrenceburg		Lawrenceburg	KY	40342
Norton		Timothy & Natalie		1061 Ninevah Rd		Lawrenceburg		Lawrenceburg	KY	40342
Laws		Kathy		1037 Ninevah Rd		Lawrenceburg		Lawrenceburg	KY	40342
Land		Clifton & Eunice		1241 Douglas Cir		Lawrenceburg		Lawrenceburg	KY	40342
Daniels		Ms. Elizabeth & Dannie Thompson		1965 Clearwater Dr		Lawrenceburg		Lawrenceburg	KY	40342
Roark		Bobby & Marcia		Post Office Box 244		Lawrenceburg		Lawrenceburg	KY	40342
Caldwell		Bruce & Lori Dawn		2304 Clearwater Dr		Lawrenceburg		Lawrenceburg	KY	40342
Taulbee		Charles & Ruth		26 Ryswick Ln		Frankfort		Frankfort	KY	40601
Seeberger		Steven & Jessica		1030 Twelve Oaks Dr		Lawrenceburg		Lawrenceburg	KY	40342
Nestos, LLC				Post Office Box 663		Lawrenceburg		Lawrenceburg	KY	40342
Messenger Temple Pentecostal Church	[1]			1053 Frankfort Rd		Lawrenceburg		Lawrenceburg	KY	40342
Eagle Lake Properties, LLC				201 S Main St		Lawrenceburg		Lawrenceburg	KY	40342
GK Technologies, Inc.				4 Tesseneer Dr		Highland Heights		Highland Heights	KY	41076

[1] Letter came back "No such address". Obtained correct address via internet, and re-mailed letter to 254 Court Street, Lawrenceburg, KY 40342.





**NOTARIZED PROOF OF PUBLICATION**

**STATE OF KENTUCKY**

**COUNTY OF** Franklin

Before me, a Notary Public, in and for said County and State, this 5<sup>th</sup> day of May, 2005, came RACHEL Mc CARTY

personally known to me, who being duly sworn, states as follows:

That she is Advertising Assistant of the My Press  
Service, Inc., and that the following

publications: see attached ran the Legal Notice for

Kentucky Utilities, Notice to Company Customers (Case No. 2005-00154). Notice of Proposed Electric Transmission Line.

Rachel McCarty  
Signed

Bonnie J. Howard  
Notary Public

My commission expires 9-18-08

# **KENTUCKY PRESS SERVICE**

**101 Consumer Lane  
(502) 223-8821**

**Frankfort, KY 40601  
FAX (502) 875-2624**

***Rachel McCarty Advertising Dept.***

List of newspapers running the Notice to Kentucky Utilities Company Customers. Attached tearsheets provide proof of publication:

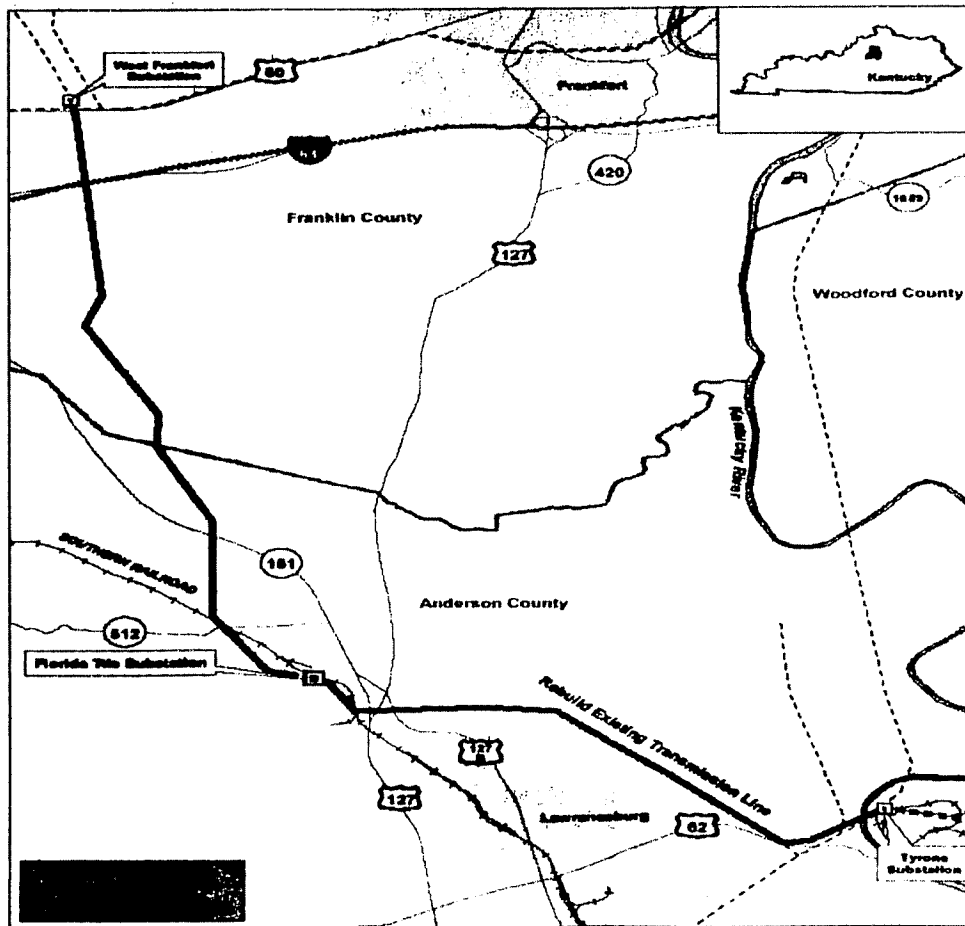
Frankfort State Journal  
Lawrenceburg Anderson News  
Versailles Woodford Sun

**NOTICE OF PROPOSED ELECTRIC TRANSMISSION LINE  
CONSTRUCTION PROJECT**

Kentucky Utilities Company ("KU") propose to construct a 138 kV transmission line to run from the West Frankfort Substation in Franklin County to the Tyrone Substation in Woodford County. 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 is currently before the Kentucky Public Service Commission ("Commission") in Case No. 2004-00507. A map showing the route of the proposed line is shown below.

KU plans to file an application with the Commission on or about May 11, 2005, seeking a certificate of public convenience and necessity authorizing this project. The purpose of the Commission's review of KU'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 Franklin, Anderson, or Woodford counties.

To seek intervention in the Commission's proceeding on KU'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 2005-00154.



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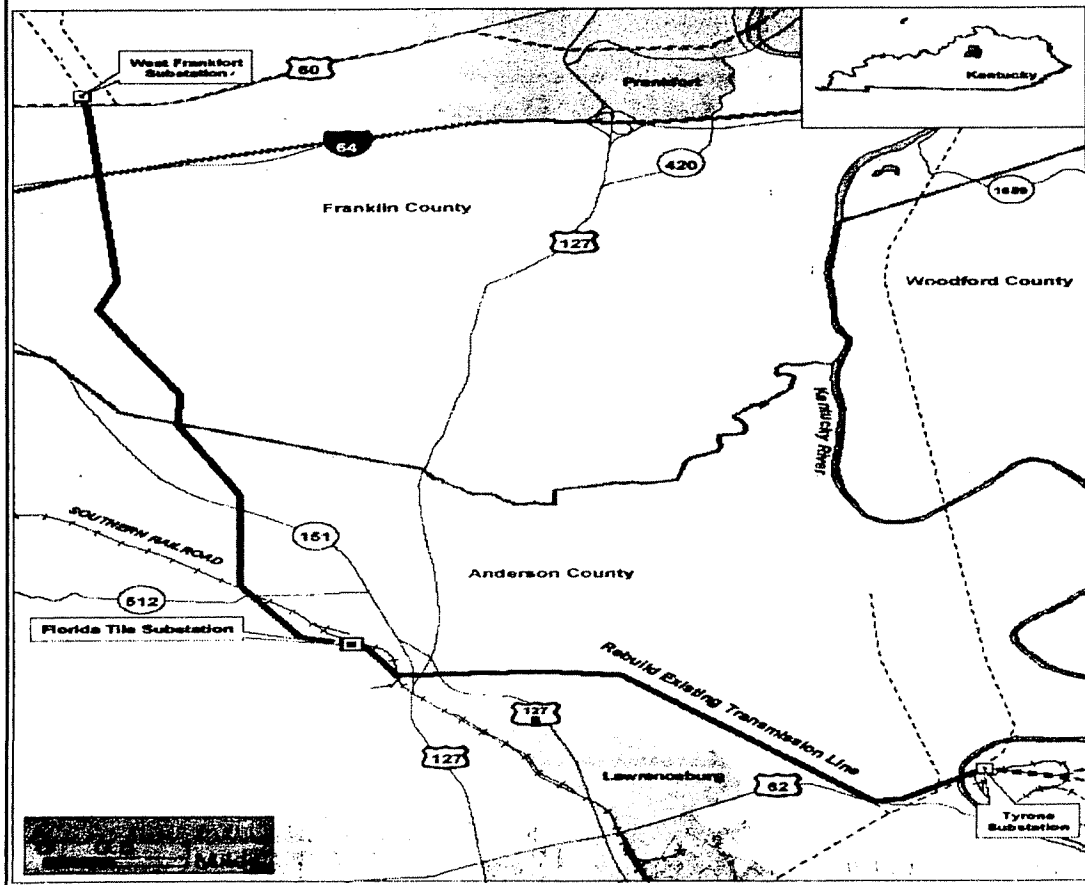
**Page C13**  
The Anderson News  
Lawrenceburg, Kentucky  
Wednesday, April 27, 2005

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**NOTICE OF PROPOSED ELECTRIC TRANSMISSION LINE  
CONSTRUCTION PROJECT**

Kentucky Utilities Company ("KU") propose to construct a 138 kV transmission line to run from the West Frankfort Substation in Franklin County to the Tyrone Substation in Woodford County. 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 is currently before the Kentucky Public Service Commission ("Commission") in Case No. 2004-00507. A map showing the route of the proposed line is shown below.

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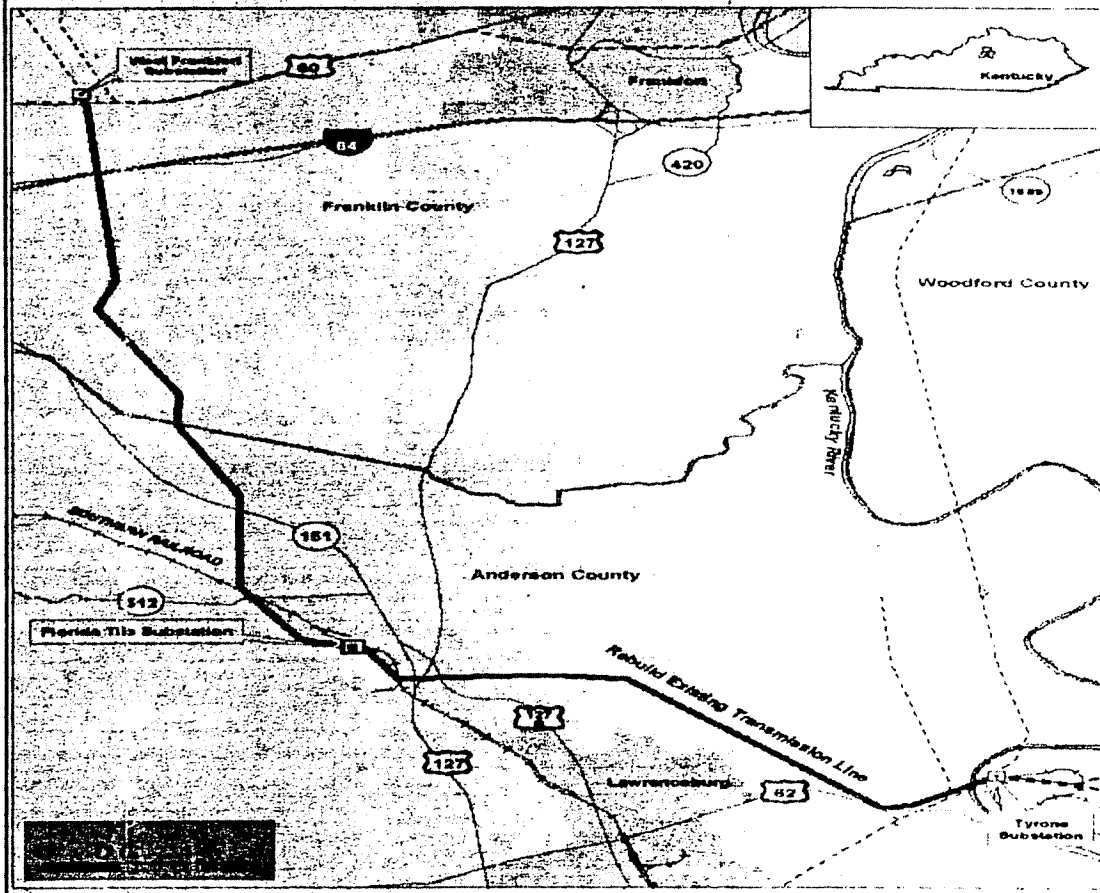


**B6 THE WOODFORD SUN, Versailles, Ky. April 28, 2005**

**NOTICE OF PROPOSED ELECTRIC TRANSMISSION LINE  
CONSTRUCTION PROJECT**

Kentucky Utilities Company ("KU") propose to construct a 138 kV transmission line to run from the West Frankfort Substation in Franklin County to the Tyrone Substation in Woodford County. 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 is currently before the Kentucky Public Service Commission ("Commission") in Case No. 2004-00507. A map showing the route of the proposed line is shown below.

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**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

**APPLICATION OF KENTUCKY UTILITIES )  
COMPANY FOR A CERTIFICATE OF PUBLIC )  
CONVENIENCE AND NECESSITY FOR THE )  
CONSTRUCTION OF TRANSMISSION FACILITIES )  
IN FRANKLIN, WOODFORD AND ANDERSON )  
COUNTIES )**

**CASE NO. 2005-00154**

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

**Filed: May 11, 2005**

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

2 A. My name is Mark S. Johnson. I hold the position of Director of Transmission for LG&E  
3 Energy Services Inc. on behalf of Kentucky Utilities Company ("KU" or "Company") .  
4 My business address is 220 West Main Street, P.O. Box 32020, Louisville, Kentucky  
5 40202.

6 **Q. Please describe your educational and professional background.**

7 A. I received my Bachelor of Science degree in Civil Engineering Technology from Murray  
8 State University in 1980. I have 23 years of experience in the utility industry. From May  
9 1980 to January 1985, I was employed by the Tennessee Valley Authority at the Watts  
10 Bar Nuclear Generating Station, where I held the position of Manager, Document Control  
11 and Configuration Management. From January 1985 to February 1987, I was employed  
12 by Entergy at the Grand Gulf Nuclear Generation Station as Manager, Engineering  
13 Support. From February 1987 to November 1997, I was again employed by the  
14 Tennessee Valley Authority, where I held a number of senior level positions in power  
15 generation, transmission, customer service and marketing. Most notably, I was Area  
16 Vice President, Transmission, Customer Service and Marketing for three and one-half  
17 years. Then, in November 1997, I joined LG&E Energy as Director, Distribution  
18 Operations. I remained in that position until January 2001, when I assumed my current  
19 position.

20 **Q. Have you previously testified before this Commission?**

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



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

5 **Q. Are you sponsoring any exhibits?**

6 A. Yes. I am sponsoring the following Exhibits:

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

11 **Q. What is the purpose of your testimony?**

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

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

16 A. The Company is seeking a certificate of public convenience and necessity ("CCN") for a  
17 138 kV transmission line which will be located in portions of Franklin, Woodford and  
18 Anderson counties in Kentucky. Specifically, this proposed line will be approximately  
19 12.4 miles and will run from KU's Tyrone Substation in Woodford County to the West  
20 Frankfort substation in Franklin County (the "Tyrone to West Frankfort Line"). This line  
21 is described more specifically in the testimony of Nate Mullins, and depicted on exhibits  
22 to that testimony, filed concurrently as part of this proceeding.

23 **Q. Why is the Company proposing to construct the Tyrone to West Frankfort Line?**

1 A. In short, the Company is proposing to construct this line because it is needed for the  
2 Company to be able to deliver reliable service to its growing native load. Specifically, in  
3 Case No. 2004-00507, the Company, together with Louisville Gas and Electric Company  
4 ("LG&E"), has filed a Joint Application for a CCN for the expansion of the Trimble  
5 County Station through the construction of a 750 MW nominal net super-critical  
6 pulverized coal-fired base load generating unit ("TC2"). As discussed in the testimony of  
7 David Sinclair in that case, KU and LG&E (collectively "the Companies") presented their  
8 2004 Joint Load Forecast ("Forecast"), which projects that the Companies will need  
9 additional base load capacity beginning in 2010, and will need between 401 MW and 552  
10 MW of capacity by 2012, in order to maintain the present reserve margin range of 13% to  
11 15%. In addition, the Companies presented a Resource Assessment which established  
12 that the construction of TC2 is the least-cost way to meet base load capacity needs. The  
13 proposed transmission line, together with other lines which are the subject of two other  
14 CCN proceedings filed concurrently herewith, is necessary to accommodate the addition  
15 of TC2 to the Company's generation fleet and allow the Company to continue providing  
16 reliable, low-cost power to its native customers.

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

18 A. KU determined that need based on studies performed by the Midwest Independent  
19 Transmission System Operator, Inc. ("MISO"). Specifically, MISO performed a  
20 Transmission Service System Impact Study ("System Impact Study") to identify  
21 constraints in the MISO transmission footprint and in adjacent non-MISO transmission  
22 systems, that might limit the delivery of power from TC2, and to make recommendations  
23 to address any system limitations. A copy of the System Impact Study is attached as

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

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

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

22 **Q. Did KU assess whether any alternative options to the construction proposed in this**  
23 **proceeding could meet its needs?**

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

6 **Q. Is the need for the Tyrone to West Frankfort dependent upon the approval of the**  
7 **Joint Application for the CCN for TC2?**

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

15 **Q. Will the construction of the Tyrone to West Frankfort Line result in any**  
16 **unnecessary duplication of facilities?**

17 A. No. MISO's System Impact Study, attached as Exhibit MSJ-1, reviewed the adequacy of  
18 existing lines, including the possibility of upgrades to those lines, and determined that  
19 those lines were not adequate and that certain additional lines were needed. As  
20 previously explained, MISO presented four options for alleviating thermal issues related  
21 to the delivery of power from TC2, and the Companies assessed those options and chose  
22 to pursue the fourth option identified in the System Impact Study.

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

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

9 **Q. Do you have a recommendation for this Commission?**

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

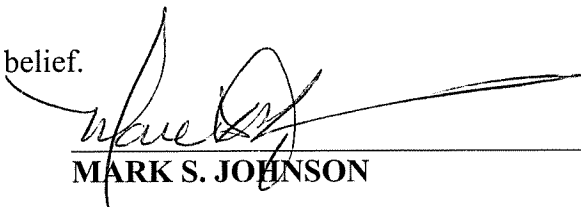
15 **Q. Does this conclude your testimony?**

16 A. Yes, it does.

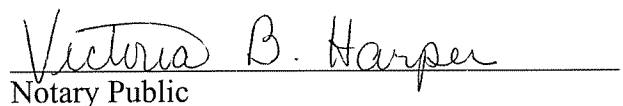
VERIFICATION

COMMONWEALTH OF KENTUCKY )  
 ) SS:  
COUNTY OF JEFFERSON )

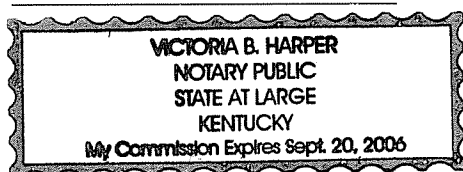
The undersigned, **Mark S. Johnson**, being duly sworn, deposes and says he is Director of Transmission for LG&E Energy Services Inc., that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information,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

  
MARK S. JOHNSON

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

  
Notary Public

My Commission Expires:







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



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## **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	Contn.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	FGATE ID/NAME	
							TYPE	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	Cont	239.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	** Base Case **	114.3	91.0	283.5	225.6	248.0	Base	199.0
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	Cont	248.8
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	Base	251.3
27128 11OC TAP 138 27139 11SCOTT 138 1 LN	** Base Case **	101.8	86.2	178.1	150.8	175.0	Cont	176.0
27132 11PISGAH 138 27153 11W LEXN 138 1 LN	27004 11BRWN N 345 27064 11BRWN N 138 1 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	126.1	78.8	205.5	128.4	163.0	Base	211.3
27137 11RODBRN 138 27336 11SHARKE 138 1 LN		146.0	100.6	141.6	97.6	97.0	Cont	72.8
9901:11BLUE L_161_20BLJT_C_161_1 for lo							Base	40
2483:Avon - Loudon 138 kV								

**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 1IHARDN 345 27012 1ISMITH 345 1 LN	27005 1IGHENT 345 27015 11W LEXN 345 1	134.2	78.8	413.3	242.6	308.0
27007 1IMIDDLT 345 27119 1IMIDDLT 138 1 TR	24952 06CLIFTY 345 27013 11TRIMBL 345 1	114.3	94.0	546.4	449.3	478.0
27012 1ISMITH 345 27142 1ISMITH 138 1 TR	27005 1IGHENT 345 27015 11W LEXN 345 1	113.9	78.1	351.0	240.5	308.0
27014 1W FRNK 345 27151 11W FRNK 138 1 TR	27005 1IGHENT 345 27015 11W LEXN 345 1	108.9	80.8	520.5	386.2	478.0
27015 1W 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 1BLUE 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 1BLUE L 161 27003 11BLUELI 345 1 TR	** Base Case **	114.6	96.7	275.0	232.0	240.0
27019 1BLUE 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 1BLUE L 161 29248 20BLIT C 161 1 LN	** Base Case **	112.1	94.4	268.0	225.7	239.0
27032 11MBODE 161 27040 11POCK N 161 1 LN	27005 1IGHENT 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					
27053 11AMERI 138 27097 11HAFLI 138 1 LN	11GHENT 345' TO BUS '11W LEXN 345	159.7	106.1	154.9	102.9	97.0
27075 11CARROL 138 24953 06CLIFTY 138 1 LN	11W LEXN 345' TO BUS '11W LEXN 138	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					
27076 11CENTRF 138 27147 11TRIMBL 138 1 LN	11GHENT 345' TO BUS '11W LEXN 345	123.4	74.4	166.6	100.4	135.0
27080 11DANVIL 138 27118 11MERCER 138 1 LN	11W LEXN 345' TO BUS '11W LEXN 138	101.5	75.6	218.2	162.6	215.0
27086 11FARM T 138 27336 11SHARKE 138 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	124.6	75.1	175.7	105.9	141.0
27090 11FLEMIN 138 27093 11GODDRD 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345	116.5	80.8	113.0	78.4	97.0
27090 11FLEMIN 138 27157 11WEDONI 138 1 LN	20SPURLK 345' TO BUS '20AVON 345					
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	20AVON 345' TO BUS '20AVON 138	126.7	94.6	200.2	149.5	158.0
27091 11FFRT E 138 27148 11TYRONE 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345	115.4	86.7	206.6	155.2	179.0
	11GHENT 345' TO BUS '11W LEXN 345	143.9	108.1	194.2	145.9	135.0
	11W LEXN 345' TO BUS '11W LEXN 138	163.0	88.7	361.8	197.0	222.0
	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
	11W LEXN 345' TO BUS '11W LEXN 138					
	Contin.Description	% Load Post	% Load Pre	Post Trans Cont	Pre Trans Cont Flow	Rating

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

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	Fgate	
							Flow	delta
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 3 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'	125.3	100.4	169.2	135.5	135.0		
27091 11FFRT E 138 27140 11SHADRA 138 1 LN	'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	'11GHENT 345' TO BUS '11W FRNK 345'	104.5	92.0	263.3	231.8	252.0		
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN	'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	11HARDN 345' TO BUS '11BRWN N 345'							
27113 11LOUDON 138 29202 20AVON 138 1 LN	11SMITH 345' TO BUS '11HARDN 345'							
27113 11LOUDON 138 29202 20AVON 138 1 LN	11HARDN 345' TO BUS '11HARDN 138'							
27148 11TYRONE 138 27151 11W FRNK 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345'	122.2	93.3	350.7	267.7	287.0		
	11W FRNK 345' TO BUS '11W FRNK 138'	106.3	85.2	263.7	211.3	248.0		
	** Base Case **	104.2	73.4	229.2	161.5	220.0		
	27004 11BRWN N 345 27014 11W FRNK 345 O1							
FGATE ID/NAME	TYPE	Rating	Post Trans Fgate Flow	Pre Trans Fgate Flow				
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 11FFERT 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	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	130.9	100.0	1032.4	789.2	789.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	11GHENT 345' TO BUS '11W LEXN 345	103.26	85.00	493.6	406.3	478.0
27019 11BLUE L 161 29248 20BLIT C 161 1 LN	11W LEXN 345' TO BUS '11W LEXN 138	103.1	86.5	246.5	206.7	239.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	27004 11BRWN N 345 27015 11W LEXN 345 1	151.2	117.9	204.2	159.2	135.0
27091 11FERT E 138 27140 11SHADRA 138 1 LN	24952 06CLIFTY 345 27013 11TRIMBL 345 1	142.6	109.9	192.5	148.4	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	'11GHENT 345' TO BUS '11W FRNK 345'	111.2	82.6	194.7	144.6	175.0
27099 11HARDBG 138 27100 11HARDN 138 1 LN	'11W FRNK 345' TO BUS '11W FRNK 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'	147.4	114.3	199.0	154.2	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	'11W FRNK 345' TO BUS '11W FRNK 138'	141.5	104.3	406.2	299.5	287.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	11W LEXN 345' TO BUS '11BRWN N 345	121.1	95.7	300.3	237.3	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	11GHENT 345' TO BUS '11W LEXN 345	103.4	76.0	180.9	132.9	175.0
27137 11RODBRN 138 27336 11SHARKE 138 1 LN	11W LEXN 345' TO BUS '11W LEXN 138	104.0	77.3	100.9	75.0	97.0
2483:Avon - Loudon 138 kV	20SPURLK 345' TO BUS '20AVON 345					
2198:Blue Lick 345/161 XFMR-Baker-Broad	20AVON 345' TO BUS '20AVON 138					
9901:11BLUE L 161 20BLIT C 161 1 for lo	Post Trans Fgate Flow					
9902:11BLUE L 161 20BLIT C 161 1 for lo	Rating					
65048:Buffington 345/138 Pierce-Foster 3	Pre Trans Fgate Flow					
	delta					
	Base	199.0	280.5	231.8	48.7	
	Cont	239.0	242.6	216.5	26.1	
	Cont	239.0	249.0	211.5	37.5	
	Cont	239.0	243.6	214.8	28.8	
	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 11HARDN 345' TO BUS '11BRWN N 345 11SMITH 345' TO BUS '11HARDN 345 11HARDN 345' TO BUS '11HARDN 138 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	101.4	96.3	506.2	480.4	499.0
27006 11HARDN 345 27100 11HARDN 138 2 TR	27004 11BRWN N 345 27015 11W LEXN 345 1 27064 11BRWN N 138 27148 11TYRONE 138 1 11GHENT 345' TO BUS '11W FRNK 345' 11W FRNK 345' TO BUS '11W FRNK 138'	108.2	92.8	435.0	372.9	402.0
27014 11W FRNK 345 27151 11W FRNK 138 1 TR	27004 11BRWN N 345 27006 11HARDN 345 1 11GHENT 345' TO BUS '11W FRNK 345' 11W FRNK 345' TO BUS '11W FRNK 138'	102.85	85.96	491.6	410.9	478.0
27015 11W LEXN 345 27153 11W LEXN 138 1 TR	27014 11W FRNK 345 27151 11W FRNK 138 1 11W LEXN 345' TO BUS '11W LEXN 138	108.56	88.08	518.9	421	478.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN	** Base Case ** 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	116.1	87.9	112.7	85.3	97.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	140.1	106.9	189.2	144.3	135.0
27085 11ETOWN 138 27124 11NELSON 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	107.2	79.2	160.9	118.8	150.0
27091 11FRT E 138 27140 11SHADRA 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	131.7	99.0	177.8	133.7	135.0
27092 11GHENT 138 27120 11MIDWAY 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1 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 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	136.4	103.3	184.2	139.4	135.0
27113 11LOUDON 138 29202 20AVON 138 1 LN	27014 11W FRNK 345 27151 11W FRNK 138 1 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	27014 11W FRNK 345 27151 11W FRNK 138 1 11W LEXN 345' TO BUS '11BRWN N 345 11GHENT 345' TO BUS '11W LEXN 345 11W LEXN 345' TO BUS '11W LEXN 138	114.9	89.9	284.9	222.9	248.0
27120 11MIDWAY 138 27153 11W LEXN 138 1 LN	20SPURLK 345' TO BUS '20AVON 345 20AVON 345' TO BUS '20AVON 138 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 11RODRN 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	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 1	24962 06PIERC2 345 25981 08FOSTER 345	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 1	27004 11BRWN N 345 27015 11W LEXN 345	115.1	91.7	550.1	438.4	478.0
27051 11ADAMS 138 27148 11TYRONE 138 1 LN 1	27064 11BRWN N 138 27148 11TYRONE 138	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 1	27004 11BRWN N 345 27006 11HARDN 345	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 TR	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 LN	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 11WLEXN	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 11WLEXN	138 1 LN	27004 11BRWN N 345 27015 11WLEXN 345	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 11WLEXN 345 27153 11WLEXN 138 1 TR	27004 11BRWN N 345 27015 11WLEXN 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 11WLEXN 345 1	112.9	77.6	211.2	145.1	187.0
27075 11CARROL 138 27112 11LOCKPO 138 1 LN	27005 11GHENT 345 27014 11WFRNK 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 11WFRNK 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 11WLEXN 138 1	103.6	95.3	261.0	240.2	252.0
27097 11HAEFLI 138 27153 11WLEXN 138 1 LN	27149 11VILEY 138 27153 11WLEXN 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 11WLEXN 138 1 LN	C114-T3	102.9	81.8	180.0	143.1	175.0
27149 11VILEY 138 27153 11WLEXN 138 1 LN	27097 11HAEFLI 138 27153 11WLEXN 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:Avan - 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**

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**March 11, 2003**

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**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.

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**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 breakers 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 than 100% 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**



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**ATTACHMENT 1 – Substation Cost Estimates & Drawings From LGEE**

**ATTACHMENT 2 -- Line Cost Estimates From LGEE**

**ATTACHMENT 3 – Line Schedules From LGEE**

## **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

<b>Task</b>	<b>Cost in 2003 Dollars</b>	<b>Cost in 2007 Dollars</b>
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
<b>Total</b>	\$59,566,683	\$67,827,327
<b>10% Markup</b>	\$5,956,668	\$6,782,733
<b>Grand Total</b>	\$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.

<b>Start Date</b>	<b>Task/Item</b>
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:**

<b>APPLICATION OF KENTUCKY UTILITIES</b>	)	
<b>COMPANY FOR A CERTIFICATE OF PUBLIC</b>	)	
<b>CONVENIENCE AND NECESSITY FOR THE</b>	)	<b>CASE NO. 2005-00154</b>
<b>CONSTRUCTION OF TRANSMISSION</b>	)	
<b>FACILITIES IN FRANKLIN, WOODFORD</b>	)	
<b>AND ANDERSON COUNTIES, KENTUCKY</b>	)	

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

**Filed: May 11, 2005**

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

2 A. My name is J. Nate Mullins. I am Manager, Transmission Line Services, for  
3 LG&E Energy Services Inc. on behalf of Louisville Gas and Electric Company  
4 (“LG&E”) and Kentucky Utilities Company (“KU”) (collectively “the  
5 Companies”). My business address is One Quality Street, Lexington, Kentucky  
6 40507. My background and work experience are described in Appendix A.

7 **Q. Are you sponsoring any exhibits?**

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

9 Exhibit JNM-1, Route Map;

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

12 Exhibit JNM-3, Alternative Route Maps.

13 **Q. What is the purpose of your testimony?**

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

20 **Q. Please describe the transmission line KU proposes to construct in this  
21 proceeding.**

22 A. KU has proposed the construction of a 138 kV transmission line, approximately  
23 12.4 miles in length, running from KU’s Tyrone Substation in Woodford County,

1 Kentucky, through Anderson County to KU's West Frankfort Substation in  
2 Franklin county as depicted on Exhibit JNM-1.

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

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

13 **Q. Has KU determined the type of transmission structures that will be utilized**  
14 **in the construction of these lines?**

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

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

19 A. Beginning in mid-2005, the Companies will start environmental and cultural  
20 studies and related surveys in areas where we have existing easements. In areas  
21 where easements must be acquired, the environmental studies will begin once  
22 permissions from the property owners have been obtained as part of the easement  
23 acquisition process. These surveys will be performed by Photo Science and are  
24 scheduled to be completed by mid-2006.

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

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

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

15 A. The estimated cost is approximately \$7.9 million.

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

18 A. After examining the load analysis performed by Midwest Independent  
19 Transmission System Operator, Inc., as described in Mr. Johnson's testimony, the  
20 Companies were able to identify the portions of our existing transmission system  
21 that would not be sufficient to provide the transmission power required. The  
22 result of the process was the identification of the areas in which transmission line  
23 needed to be added, rather than merely upgraded. Those areas are (i) between  
24 LG&E's Mill Creek Substation and KU's Hardin County Substation, (ii) from

1 Service Indiana 345 kV transmission line near Marble Hill, Indiana, and (iii) from  
2 KU's Tyrone Substation to KU's West Frankfort Substation.

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

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

18 Once the route alternatives were identified, they were evaluated according  
19 to the Electric Power Research Institute ("EPRI") Standardized Method of Siting  
20 Overhead Transmission Lines. The EPRI methodology was used to statistically  
21 compare route alternatives based on their relative impacts to the built  
22 environment, including relocating residences, proximity to residences, proposed  
23 developments, proximity to commercial and industrial buildings, schools, day  
24 care centers, churches, cemeteries and parks; relative impacts to the natural

1 environment including natural forests, stream and river crossings, wetlands, and  
2 flood plains; and engineering criteria including miles of rebuild of existing  
3 transmission lines, miles of co-location with existing utilities and roads, and total  
4 project cost. The resulting preferred routes balance impacts to people, the natural  
5 environment and cost.

6 **Q. Please describe how the route for the line in this proceeding was selected.**

7 A. In the summer of 2003 the Companies commissioned Photo Science Geospatial  
8 Solutions to conduct macro corridor analysis initiating the route selection process.  
9 The primary data set used for this analysis was a 1993 land cover map prepared  
10 by the United States Geological Survey and distributed by the Kentucky Office of  
11 GIS. Additionally existing transmission lines and other linear infrastructure were  
12 identified. Following the EPRI methodology for siting transmission lines,  
13 suitability values were assigned to land cover types. The least cost path algorithm  
14 was applied to generate a map which illustrates the corridors of least resistance  
15 between the start and end points. Macro corridors utilize the most suitable areas to  
16 make the desired connections between end points. The corridors may have a  
17 width of as much as a mile or greater for segments that have substantial length  
18 through areas with negligible constraints. In developed areas, narrow corridors  
19 are often defined, but they should still have enough width to provide flexibility for  
20 engineering considerations in final routing of the line. Frequently, existing linear  
21 facilities, especially of a similar type as the facility being sited, oriented in  
22 appropriate directions are substantial opportunities for co-locating a proposed  
23 facility and may be identified as macro corridors.

1           Within the macro corridors aerial photographs and ancillary data were  
2 compiled. Based on this information, six (6) alternative routes were identified  
3 maximizing the use of existing utility corridors and minimizing impacts on people  
4 and the natural environment. Aerial photography was used to map built,  
5 environmental and engineering constraints in proximity to the alternative routes.  
6 Field surveys were conducted to identify types of buildings and other important  
7 criteria. Route alternatives were also evaluated from helicopter. Detailed cost  
8 estimates were completed for the alternatives and they were compared using the  
9 EPRI siting methodology. The resulting preferred route balances impacts to  
10 people, the natural environment and cost. Aerial surveys were performed along  
11 the preferred route to create detailed planimetric and topographic maps and aerial  
12 photography. County property valuation administrators' data was used to identify  
13 property lines along the preferred route. Based on these detailed maps and  
14 ancillary data, the preferred route was chosen as the optimum route as  
15 recommended by utilizing the EPRI siting methodology.

16 **Q. Please describe the factors that led KU to select the route that it did for the**  
17 **subject transmission line.**

18 A. The preferred route begins at the Tyrone Plant and rebuilds an existing  
19 transmission line for approximately 4.7 miles to the existing Florida Tile  
20 Substation 0.3 miles west of U.S. Highway 127. In order to minimize impacts to  
21 people and the natural environment, the new line will replace the existing 69 KV  
22 line to the Florida Tile Substation on existing right of way. At the Florida Tile  
23 Substation, the route heads north, in a new corridor, through predominantly rural,  
24 agricultural land for approximately 7.7 miles. The route encounters a few areas of



1 low density residential areas along transportation corridors before crossing  
2 Interstate 64 and into the West Frankfort substation.

3 In comparison to the alternative routes, the preferred route is the shortest  
4 route when considering new right of way. Thirty seven percent (37%) of the  
5 preferred route will be constructed on existing right of way.

6 **Q. Did KU hold any meetings to make the public aware of the plans to construct  
7 the transmission lines and to receive comments from interested participants?**

8 A. Yes. On April 26, 2005, KU held a public information meeting at the Robert B.  
9 Turner Elementary School in Lawrenceburg.

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

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

18 **Q. Does this conclude your testimony at this time?**

19 A. Yes.

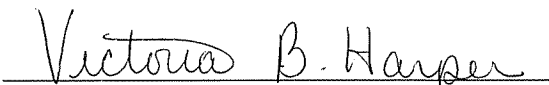
**VERIFICATION**

<b>COMMONWEALTH OF KENTUCKY</b>	)	
	)	<b>SS:</b>
<b>COUNTY OF JEFFERSON</b>	)	

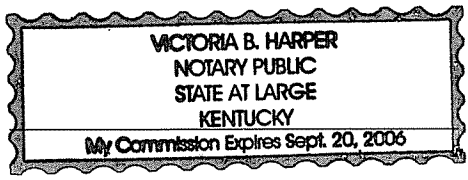
The undersigned, **J. Nate Mullins**, being duly sworn, deposes and says he is the Manager, Transmission Line Services for LG&E Energy Services, Inc., that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the 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 10<sup>th</sup> day of May 2005.

  
Victoria B. Harper  
Notary Public

My Commission Expires:



## **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)

