

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF)	
LOUISVILLE GAS AND ELECTRIC)	CASE NO. 2019-00301
COMPANY FOR AN AMENDED)	
GAS LINE TRACKER)	

DIRECT TESTIMONY OF
JOHN P. MALLOY
VICE PRESIDENT, GAS DISTRIBUTION
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: September 27, 2019

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

2 A. My name is John P. Malloy. I am the Vice President of Gas Distribution for
3 Louisville Gas and Electric Company (“LG&E” or “Company”) and an employee of
4 LG&E and KU Services Company, which provides services to LG&E and KU. My
5 business address is 220 West Main Street, Louisville, Kentucky 40202.

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

7 A. A statement of my professional history and education is attached to this testimony as
8 Appendix A.

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

10 A. Yes. I have testified in previous proceedings before the Commission. Most recently, I
11 testified in LG&E’s 2016 base rate case and a proceeding for an application of a
12 certificate of public convenience and necessity for advanced metering systems.¹

13 **Q. What are the purposes of your testimony?**

14 A. The purposes of my testimony are to: (1) describe why the Company needs to replace
15 some sections of its transmission pipelines; (2) explain the projects the Company has
16 identified for those replacements; and (3) explain how those replacement projects are
17 the least-cost reasonable solution to meeting the Company’s safety, reliability, and
18 compliance obligations. As part of the Company’s continuous efforts and plans to
19 maintain its pipelines so that they are safe, reliable, and compliant, the Company
20 proposes the projects described below. The Commission’s approval of these projects

¹ *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00371; *In the Matter of: Electronic Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for a Certificate of Public Convenience and Necessity for Full Deployment of Advanced Metering System*, Case No. 2018-00005.

1 as part of the Company's Gas Line Tracker Program will allow the Company to
2 implement its ongoing plan to ensure pipeline safety, reliability and integrity. My
3 testimony describes why and how the Company proposes to do so.

4 **I. THE NEED TO REPLACE PIPELINE SEGMENTS**

5 **Q. Describe generally the need to replace pipeline segments and which of the**
6 **Company's lines need segments replaced.**

7 A. For a variety of reasons discussed in more detail below, the Company needs to
8 replace several relatively short pipeline segments to establish only 16-inch and 20-
9 inch diameter pipeline for its Western Kentucky A and B pipelines and replace short
10 segments of oversized road crossings in its Magnolia 16-inch and 20-inch pipelines.
11 Currently, the Company has sections of 16-inch pipe, 20-inch pipe, and 22-inch pipe
12 in its Western Kentucky A and B pipelines. So that more enhanced inline pipeline
13 inspection tools (than previously used on the Company's system) can be used cost-
14 effectively, the Company needs to eliminate the 22-inch segments of pipe in the
15 Western Kentucky A and B pipelines. This would leave only 16-inch and 20-inch
16 pipe on the subject lines which will allow for cost-effective inspection of those pipes
17 using state-of-the-art inline inspection ("ILI") tools. The dual diameter pipeline will
18 greatly facilitate LG&E's timely and more thorough inspections, and thus improve
19 pipeline safety, reliability and integrity. The proposed replacement projects would be
20 made to the Company's Western Kentucky A Line, the Company's Western
21 Kentucky B Line, and will make the Company's 16-inch and 20-inch Magnolia Lines
22 single diameter.

23 **Q. Explain how ILIs are used to inspect natural gas pipelines.**

1 A. The most efficient way to inspect natural gas pipelines and gather robust data about
2 the integrity of pipelines is to perform ILIs. The ILI process involves inserting a
3 “tool” or “smart pig” into the pipeline and having the tool travel the length of the line.
4 As that tool travels, it gathers voluminous data about the line that can be used to
5 assess the overall integrity of the pipe including the presence of wall loss, dents, and
6 other pipe anomalies. ILIs are an excellent way of thoroughly and timely assessing
7 pipe in a non-destructive manner. They are the only method of thoroughly inspecting
8 long stretches of pipelines with the ability to gather robust data about the pipeline for
9 the entire length being inspected. Current tools perform very well using this
10 enhanced inspection technology when the pipeline being inspected has the same
11 diameter for the entire length of the line. Performing ILIs when possible rather than
12 performing a pressure test or a direct assessment provides data (wall loss, dents,
13 pipeline grade, and seam information) critical to assessing the overall integrity of the
14 pipeline. And the Commission has agreed: “the Commission finds that use of ILI
15 tools to conduct integrity reassessment is preferable to other accepted methods.”²

16 However, ILI tools with the enhanced inspection technologies are not
17 currently available for pipelines of varying diameter with operating characteristics
18 such as those in the Western Kentucky A and B pipelines and other lines in the
19 LG&E’s gas transmission system. A common problem that can create data issues
20 during an ILI run is a “speed excursion.” ILI tools can get temporarily stuck in
21 pipeline fittings such as reducers used to change pipeline diameter. As the pressure
22 downstream of the tool drops due to end user gas consumption, the differential

² *In the Matter of: Application of Louisville Gas and Electric Company for Approval of State Waiver of the Reassessment Interval Required by 49 C.F.R. 192.939, Case No. 21700482, Order of June 3, 2019, p. 14.*

1 pressure across the tool increases. When the differential pressure increases enough,
2 the tool typically breaks free. The tool can break free and exit the fitting at a high
3 velocity known as a “speed excursion.” When a speed excursion happens, the tool’s
4 ability to capture all data desired is compromised. When a data compromise happens,
5 the Company risks not obtaining the data it needs to accurately assess the condition of
6 all areas of the line being inspected.

7 **Q. Why does the Company need to move towards making the Western Kentucky A**
8 **and B lines dual pipe diameter?**

9 A. In addition to the need of making the Western Kentucky A and B pipelines dual
10 diameter so the dual diameter tools under development can be used, as described
11 above, when diameter changes are reduced, the risk of speed excursions are likewise
12 reduced. This means fewer speed excursions resulting in a more complete collection
13 of pipeline data. A move towards a more uniform diameter size will enable the
14 Company to perform ILIs and gather all necessary data with reduced likelihood of
15 any “data gaps.”

16 **Q. Should the entire length of a pipeline be the same size diameter?**

17 A. Yes, given the state of current ILI tool technology. But replacing all the pipelines to
18 achieve the same size diameter is not cost-effective. Therefore, the Company has
19 contracted with an ILI tool vendor (Rosen USA) for the design and subsequent
20 Company use of a multi-diameter tool that will enable the inspection of a pipeline
21 consisting of 16-inch and 20-inch segments. The new tool is being developed so it is
22 able to gather the needed data for pipeline assessment as it will be built to gather
23 required data for both 16-inch to 20-inch pipelines during the same run. However, it

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1 will not be able to handle a transition to 22-inch pipe. This is why the Company's
2 proposed projects include the elimination of 22-inch pipe. The Company's cost
3 payable to Rosen during 2020 – 2021 is \$[REDACTED] million. As described in Mr. Conroy's
4 testimony, the Company proposes that contractual cost, along with the capital cost of
5 the projects described below, be included in the Company's Gas Line Tracker
6 mechanism.

7 **Q. Couldn't the Company just use existing single diameter ILI tools and inspect**
8 **each segment of different sized pipe individually?**

9 A. Yes, it could, but that would be extremely expensive. As described in more detail
10 below, that approach would require an estimated 25 individual ILIs on just the
11 Western Kentucky A and B lines alone. Each ILI is expensive. It is far more
12 economical to replace the proposed limited section of pipe and drastically reduce the
13 number of ILIs than to leave the pipe as is and incur the expense of multiple runs.
14 The Company has prepared a cost study which is attached to my testimony as Exhibit
15 JPM-1.

16 **Q. Explain the conclusions reached in the Company's cost study.**

17 A. The cost study reviewed the three proposed replacement projects (Western Kentucky
18 A pipeline, Western Kentucky B pipeline and the Magnolia lines oversized road
19 crossings). The study demonstrates that the cost for the recommended option of
20 replacing the 22-inch pipeline segments and short segments of 16-inch pipeline in the
21 Western Kentucky A and B pipelines and replacing the oversized road crossings in
22 the 16-inch and 20-inch Magnolia pipelines is less expensive than the alternatives
23 reviewed. In addition to the recommended option being more cost effective, it also

1 reduces risks of speed excursions by reducing the number of diameter changes in the
2 pipelines.

3 **Q. Do federal regulations encourage the use of ILIs for pipeline integrity**
4 **assessment?**

5 A. Yes, the Company believes so. Pending federal regulations require the Company to
6 be able to verify the maximum allowable operating pressure (“MAOP”) of its lines.³
7 This MAOP verification requirement is the subject of a proposed near final regulation
8 promulgated by the Pipeline and Hazardous Materials Safety Administration
9 (“PHMSA”).⁴ This nearly enacted regulation is the next step in PHMSA’s response
10 to the causation issues associated with the 2010 incident in San Bruno, California. To
11 make the required MAOP verification, the Company may pressure test its lines and
12 incur the risk of damage to the pipeline being inspected in the course of that pressure
13 testing. Instead, data about the pipeline gathered from ILIs in conjunction with
14 critical engineering assessment techniques can be used to verify the pipeline’s
15 MAOP.

16 **II. DESCRIPTION OF THE INDIVIDUAL PROJECTS**

17 **Q. Please describe the project proposed for the Company’s Western Kentucky A**
18 **Line.**

19 A. The Company’s Western Kentucky A Line consists of 6.4 miles of 16-inch pipe, 13.5
20 miles of 20-inch pipe, and 2.44 miles of 22-inch pipe with the 18 segments described
21 in Exhibit JPM-2.

³ Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines, 81 Fed. Reg. 20722, 20722 (Apr. 8, 2016).

⁴ <https://www.regulations.gov/document?D=PHMSA-2011-0023-0118>

1 The Company proposes to replace the 2.44 miles of 22-inch pipe with 20-inch
2 pipe thereby allowing the use of the multi-diameter tool for an ILI. The 22-inch
3 segments to be replaced run parallel to the Paducah & Louisville Railroad between
4 Stonestreet Road and Lewis Way in Louisville. The work also includes achieving
5 size uniformity where the line crosses the CSX Railroad and Blevins Gap Road. At
6 those crossings, there are short stretches of 16-inch and 20-inch pipe. The Company
7 will replace the 16-inch segments with 20-inch segments so the crossings will be
8 exclusively 20-inch diameter. Uniform diameter at the crossings will further facilitate
9 the ILI process and reduce the risk of speed excursions due to diameter change.

10 When the work is completed, the Company will have eliminated ten instances
11 of pipeline diameter change thereby eliminating ten potential speed excursions and
12 the associated risk of incomplete pipeline integrity data. The Company believes that
13 existing easements can largely be used for the work, but some new temporary
14 construction easements and new minor permanent easements may be necessary. The
15 estimated project cost is \$20.0 million and it will be completed during 2019 – 2022.

- 16 **Q. Has the Company considered alternatives to the Western Kentucky A project?**
- 17 A. Yes. Alternatives were considered for obtaining the same robust pipeline integrity
18 data including performing a separate ILI for each individual segment of different
19 sized pipe or replacing all of the 22-inch and 16-inch pipeline and use a single
20 diameter tool. The separate ILI runs would mean having to perform up to 13
21 individual ILIs for the Western Kentucky A line. There are 18 diameter changes on
22 the Western Kentucky A pipeline. This alternative assumes that the enhanced tool
23 run would not have to be performed on one of the segments because it was recently

1 installed. The two short segments of 16-inch pipeline included in this alternative
2 would eliminate four tool runs. Given the cost of performing a single ILI, it is far
3 more economical to replace just the 22-inch sections and then use the multi-diameter
4 tool being developed so that a single ILI can be performed on the entirety of the
5 Western Kentucky A line. As shown in Exhibit JPM-1, the Company's proposal is
6 the least cost reasonable solution.

7 **Q. Please describe the project proposed for the Company's Western Kentucky B**
8 **Line.**

9 A. The Company's Western Kentucky B Line consists mostly of 16-inch and 20-inch
10 pipe. It has 4.4 miles of 16-inch pipe, 17.9 miles of 20-inch pipe, and just 262 feet of
11 22-inch pipe where the line crosses the Gene Snyder Freeway. The line consists of
12 the 15 segments described Exhibit JPM-2.

13 The Company proposes to replace that short segment of 22-inch pipe along
14 with 0.51 miles of 16-inch pipe with 20-inch pipe at five different locations. This
15 work would eliminate nine diameter changes. Although the multi-diameter tool will
16 be designed to handle those diameter differentials, each diameter differential still
17 poses the risk of a speed excursion. Therefore, given that so many diameter
18 differentials can be eliminated with such a short length of replacement, prudence
19 requires this 0.51 mile replacement. It will result in a much "smoother" ILI process.

20 The Company expects that existing easements can largely be used, but there is
21 a possibility of needing additional temporary construction easements and minor
22 permanent easements, particularly if replacement at the Gene Snyder Freeway
23 requires horizontal directional drilling. The estimated project cost is \$5.4 million and

1 it will be completed during 2019 – 2022. As with the Western Kentucky A Line, the
2 Company has considered alternatives to this project. But, again, the alternatives
3 would require multiple individual ILIs for each different segment of line. There are
4 15 diameter changes on the Western Kentucky B pipeline. As described in JPM-2,
5 the first alternative considered assumes that the enhanced tool run would not have to
6 be performed on one of the segments that is expected to be eliminated as part of
7 another project. The short segment of 16-inch pipeline included in that alternative
8 would eliminate two tool runs by replacing all of the 22-inch and 16-inch pipeline and
9 use of a single diameter tool. But as shown in JPM-2, the recommended solution
10 results in the Company being able to run a single ILI for the entire length of the line,
11 which is the most cost-effective solution for obtaining robust pipeline integrity data.
12 Therefore, it is the recommended option.

13 **Q. Please describe the project proposed for the Company’s Magnolia Lines.**

14 A. The Company’s pipelines running from the Magnolia Compressor Station in LaRue
15 County to the Muldraugh Compressor Station in Meade County (called the Magnolia
16 lines) consist of a 16-inch line and 20-inch line running from the Magnolia
17 Compressor Station in LaRue County to approximately Radcliff, KY in Hardin
18 County, where they combine to a single 16-inch pipeline running to the Muldraugh
19 Compressor Station in Meade County. Each line has road crossings with larger
20 diameter pipe, which could present speed excursion problems during an ILI run. On
21 the 16-inch lines, there are six road crossings where 20-inch line is in place. On the
22 20-inch line, there are two road crossings where 24-inch line is in place. The
23 Company refers to these as “oversized” crossings. The project entails replacing all

1 eight oversized crossings with pipe that matches the upstream and downstream pipe.
2 This would mean replacing just .23 miles of the 16-inch line and .11 miles of the 20-
3 inch line. Fortunately, the Company will be able to simply insert the new and smaller
4 replacement line into the existing larger diameter line where possible so complete
5 removal of the larger segments will not be necessary. The project also includes
6 eliminating a 90-degree elbow on each line near New Glendale Road. Removal of
7 that elbow will facilitate the ILI tool’s travel.

8 Existing easement is expected to be used for the project. The estimated cost is
9 \$5.9 million and the project can be completed during 2019 – 2021 Alternatives to this
10 project would be to use the dual diameter tool under development for the 16-inch
11 Magnolia line and then for the 20-inch line either perform individual ILI tool runs or
12 develop a dual diameter tool for 20-inch and 24-inch pipelines. Not removing the 20-
13 inch segments in the 16-inch line described previously would increase the risk of
14 speed excursions where the diameters change versus removing the short segments
15 making the line single diameter. There is no tool currently available that can inspect
16 the 24-inch “oversized” crossings on the 20-inch line. Therefore, eliminating the
17 diameter differentials at the oversized crossings is the least cost reasonable solution
18 for obtaining the needed integrity data.

19 **III. CONCLUSION**

20 **Q. What is your recommendation?**

21 A. I recommend the Commission approve the projects described above for inclusion in
22 the Company’s Gas Line Tracker mechanism along with the Company’s contractual
23 cost with Rosen USA. The replacement projects are necessary to maintain and
24 improve the safety and reliability of LG&E’s gas transmission system.

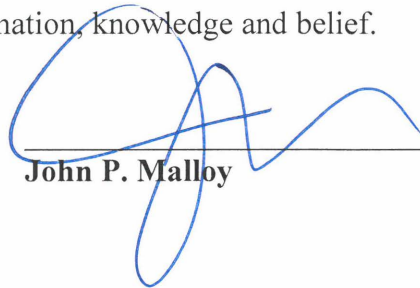
1 Q. **Does this conclude your testimony?**

2 A. Yes, it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **John P. Malloy**, being duly sworn, deposes and says that he is Vice President – Gas Distribution for Louisville Gas and Electric Company and an employee of LG&E and KU Services Company, and 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.



John P. Malloy

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 27th day of September 2019.



Notary Public (SEAL)

My Commission Expires:

Judy Schooler
Notary Public, ID No. 603967
State at Large, Kentucky
Commission Expires 7/11/2022

APPENDIX A

John P. Malloy

Vice President, Gas Distribution
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
Telephone: (502) 627-4836

Education

Spalding University, Doctorate of Education, Leadership – currently enrolled

Indiana University, Master Business Administration – 2000

Indiana University, B.S. in Finance – 1998

Previous Positions

LG&E – KU Services Company

2017 – Current	Vice President, Gas Distribution
2013 – 2017	Vice President of Customer Services
2007 – 2013	Vice President of Energy Delivery – Retail Business
2003 – 2007	Director of Generation Services

Louisville Gas and Electric Company, Louisville, Kentucky

1998-2003	Maintenance Manager, Mill Creek
1996-1998	Manager Resource / Project Management, Louisville Gas and Electric - Fleet
1989-1996	Instrument and Electrical Supervisor, Mill Creek
1986-1989	Instrument and Electrical Technician, Mill Creek
1984- 1986	Production Operations, Mill Creek
1983- 1984	Coal Handling Operations, Cane Run
1980- 1983	Instrument and Electrical Technician, Cane Run

Other Professional Associations

Spalding University	2016 – current	Board of Trustees
Louisville Orchestra	2016 – current	President, Board of Directors
	2012 – 2016	Executive Committee – Board of Directors
	2008 – 2012	Vice President of Development
LG&E Credit Union	2010 – current	Chairman Emeritus
	2001 - 2010	Chairman and CEO, Board of Directors
	1998 - 2001	Treasurer, Board of Directors
	1995 - 1998	Board of Directors

Leadership Kentucky Board of Directors

2016 – current Secretary, Executive Committee

2009 – 2016 Board of Directors

Catholic Education Foundation

2016 – current Board of Directors

Kentucky Association of Manufacturers

2016 – 2018 Chairman – Board of Directors

2012 – 2016 Executive Committee – Board of Directors

2010 – 2012 Chairman of Energy / Natural Resources Policy
Committee

LEAST COST ANALYSIS FOR PIPELINE INSPECTIONS **LOUISVILLE GAS AND ELECTRIC COMPANY**

Executive Summary

Louisville Gas and Electric Company (the “Company” or “LG&E”) has considered various alternatives in assessing the safety, integrity, and reliability of several of the gas pipelines in its transmission and distribution system via inline inspections. The Company has considered both the efficacy and costs of each alternative considered. Due to the existing multiple diameter characteristics of some its existing lines and the difficulty and risks of inline inspections of those lines, the Company has determined that it either needs to perform multiple individual inline inspections of each differing diameter segment of those lines or replace segments of lines to achieve a more uniform diameter. The Company has concluded that efficacy and cost-effectiveness are best achieved by modifying some of its lines to achieve a more uniform diameter thereby minimizing the number of inline inspections that will have to be performed. Details of the Company’s analysis and recommendations are set forth below with respect to the Company’s Western Kentucky A Line, Western Kentucky B Line, and Magnolia Lines.

Western Kentucky A Pipeline

The Western Kentucky A pipeline consists of the following:

- Approximately 13.5 miles of 20-inch diameter pipeline
- Approximately 6.4 miles of 16-inch diameter pipeline
- Approximately 2.4 miles of 22-inch diameter pipeline
- Total of approximately 22.3 miles of pipeline
- 18 diameter changes

Recommended Option for the Western Kentucky A pipeline

After consideration of the alternatives described below, LG&E recommends the following pipeline be replaced on the Western Kentucky A pipeline in conjunction with the development of a dual diameter inline inspection tool that can perform desired inspections for both 16-inch and 20-inch diameter pipelines to facilitate inline inspection of these natural gas transmission pipelines:

- a. Replace 2.44 miles of 22-inch pipeline with 20-inch pipeline.
- b. Replace 0.14 miles of 16-inch pipeline with 20-inch pipeline at two locations where the 16-inch pipeline is a short section connecting with 20-inch pipeline at each end.

The table below summarizes the capital investment and expenditures for the recommended option and alternatives (discussed below) along with a net present revenue requirement for each option.

Option	Capital Investment (\$ millions)	O&M Expenditures (\$ millions)	NPVRR (\$ million)
Recommended	\$20.0	\$56.0	\$39.3
Alternative 1	\$0.3	\$327.0	\$82.0
Alternative 2	\$48.9	\$38.0	\$64.9

For purposes of this analysis, assumed O&M expenditures for the recommended option include:

1. Half the cost for development of the dual diameter inline inspection tool (2019 – 2021). The other half of the cost is considered for the Western Kentucky B Pipeline.
2. Required assessments using current inline inspection tools for the Western Kentucky A in 2019.
3. Inline inspections of the Western Kentucky A line in 2022 using the new dual diameter tool.

4. Future inspections using the dual diameter tool to assess the line.

The following aerial photos depict locations for the recommended 16-inch and 22-inch replacements on the Western Kentucky A pipeline:

Photo 1 – For the Western Kentucky A pipeline the photo depicts the approximately 2.44 miles of 22-inch pipeline.

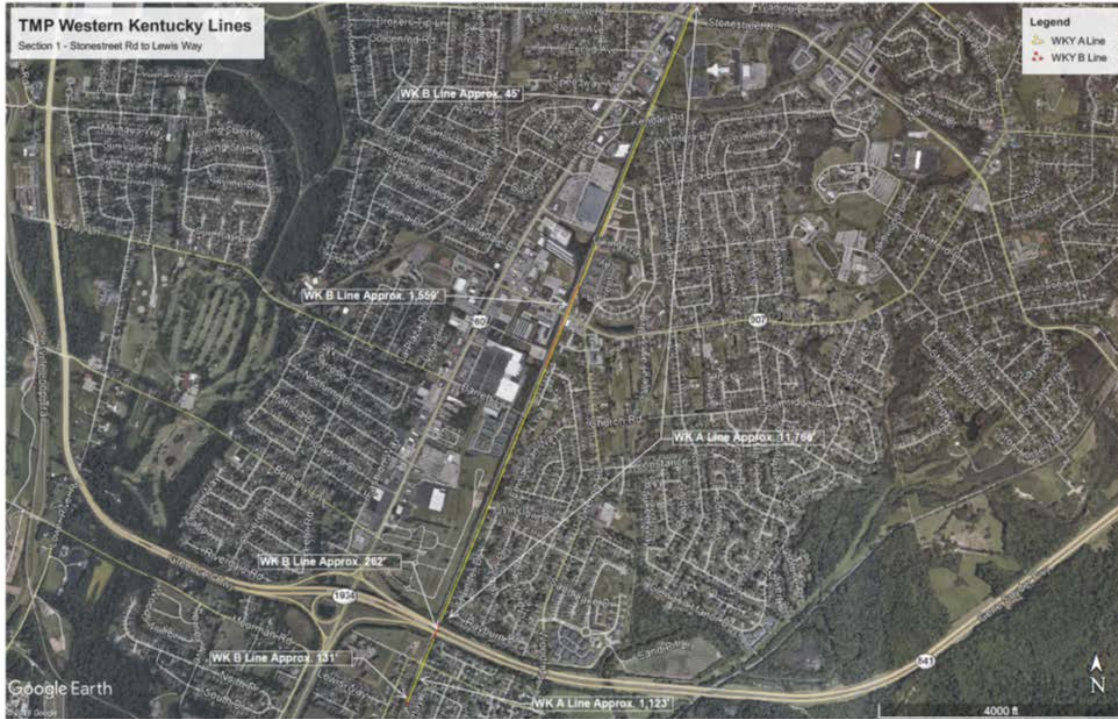
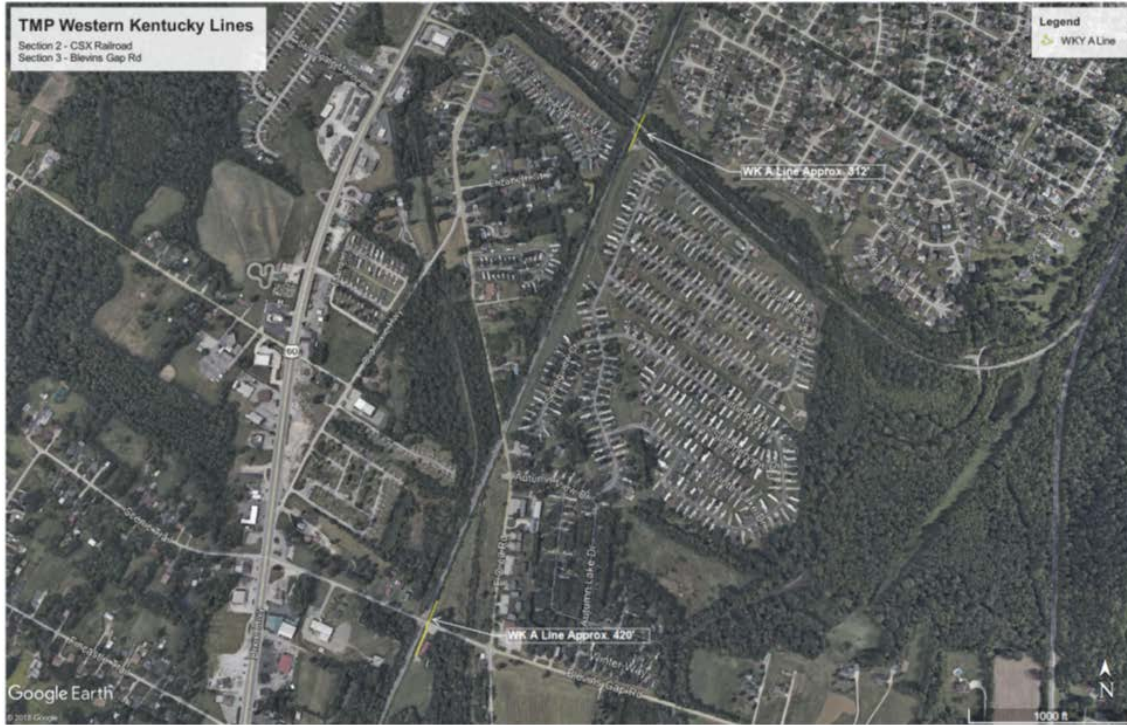


Photo 2 – For the Western Kentucky A pipeline the photo depicts the approximately 0.14 miles of 16-inch pipeline recommended to be replaced made up of 2 segments.



Alternative 1

The first alternative considered includes performing inline inspections (ILIs) on each single-diameter section of pipeline. For transmission pipelines like the Western Kentucky A pipeline, which has frequent changes in diameter, running ILIs on each individual segment is impractical. To the extent it could be done at all, it would be dramatically more expensive due to inspections being conducted on 13 segments of single-diameter pipeline on the Western Kentucky A and B gas transmission lines alone. There are 18 diameter changes on the Western Kentucky A pipeline. This alternative assumes that the enhanced tool run would not have to be performed on one of the segments because it was recently installed. The two short segments of 16-inch pipeline included in this alternative would eliminate four tool runs. These ILIs would be run every seven years in order to comply with PHMSA regulations. Replacement of a 270-foot and 420-foot section of 16-inch pipe was included in this alternative due to their short lengths.

Pipeline Replacements for Alternative 1 would be:

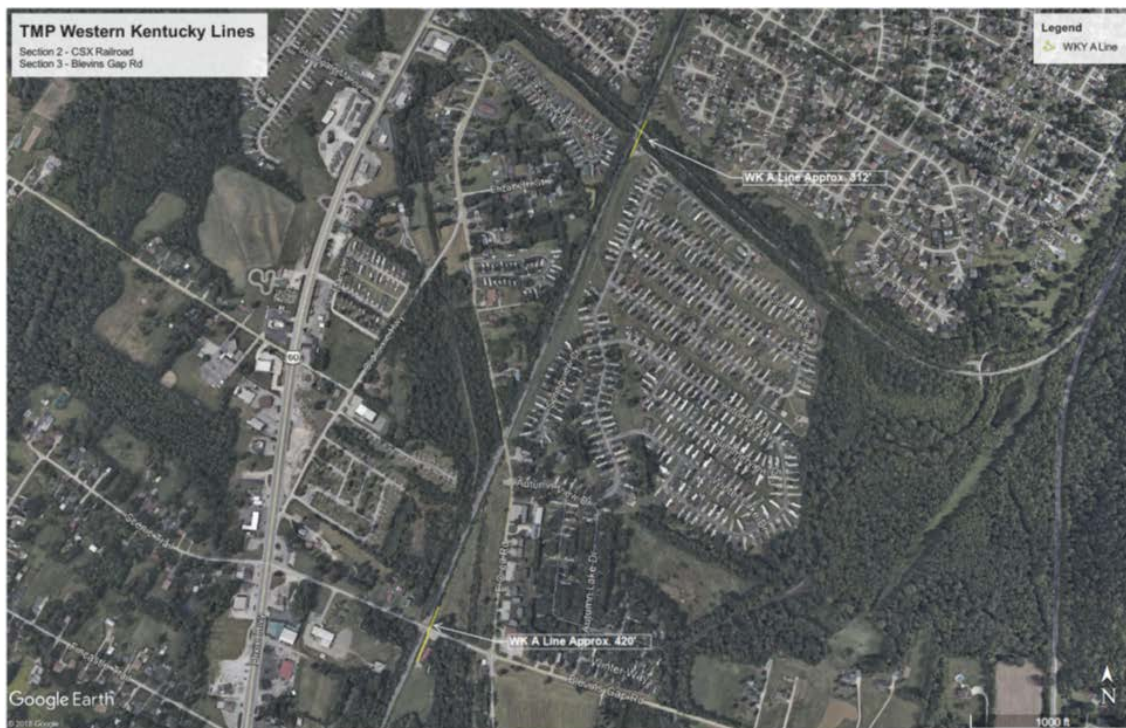
- a. Replace 0.14 miles of 16-inch pipeline with 20-inch pipeline at two locations where the 16-inch pipeline is a short section connecting with 20-inch pipeline at each end.

The summary table above sets forth capital and O&M expenditures for this alternative. O&M expenditures include:

1. Expenditures to run single diameter enhanced inline inspection tools on the Western Kentucky A line by running them in all segments individually when the diameter changes.
2. Future inspections using the single diameter tool to assess the line.

The following aerial photo depicts locations for Alternative 1 for replacing the two 16-inch segments described in the Western Kentucky A pipeline.

Photo 2 – For the Western Kentucky A pipeline the photo depicts the approximately 0.14 miles of 16-inch pipeline recommended to be replaced made up of 2 segments.



Alternative 2

A second alternative considered was to replace all segments of 16-inch and 22-inch diameter on the Western Kentucky A pipeline to standardize the pipelines with 20-inch diameter pipe. By doing this, an existing 20-inch single diameter tool could be run on this pipeline. The capital replacement costs on the Western Kentucky A pipeline are projected to cost about \$49 million.

Pipeline Replacements for this alternative would be:

- a. Replace all of approximately 6.4 miles of 16-inch pipeline.
- b. Replace all of approximately 2.44 miles of 22-inch pipeline.

The summary table above sets forth the capital and O&M expenditures for this alternative. O&M expenditures include:

1. Required assessments using current inline inspection tools for the Western Kentucky A line in 2019.
2. Enhanced inspections using the single diameter tool in 2022.
3. Future inspections using the single diameter tool to assess the line.

Western Kentucky B Pipeline

The Western Kentucky B pipeline consists of the following:

- Approximately 17.9 miles of 20-inch diameter pipeline
- Approximately 4.4 miles of 16-inch diameter pipeline
- Approximately 262 feet of 22-inch diameter pipeline
- Approximate total of 22.3 miles of pipeline
- 15 diameter changes

Recommended Option for the B pipeline

After consideration of the alternative described below, LG&E recommends the following pipeline be replaced on the Western Kentucky B pipeline in conjunction with the development of an inline inspection tool that can perform desired inspections for both 16-inch and 20-inch diameter pipelines to facilitate inline inspection of these natural gas transmission pipelines:

- a. Replace 262-feet of 22-inch pipeline with 20-inch pipeline.
- b. Replace 0.51 miles of 16-inch pipeline with 20-inch pipeline at multiple locations where the 16-inch pipeline is a short section connecting with 20-inch pipeline at each end

The table below summarizes the capital investment and expenditures for the recommended option and alternatives along with a new present revenue requirement.

Option	Capital Investment (\$ millions)	O&M Expenditures (\$ millions)	NPVRR (\$ million)
Recommended	\$5.4	\$55.3	\$21.3
Alternative 1	\$0.1	\$302.2	\$70.8
Alternative 2	\$27.0	\$37.3	\$41.5

For purposes of this analysis, assumed O&M expenditures for the recommended option include:

1. Half the cost for development of the dual diameter inline inspection tool (2019 – 2021).
The other half of the cost is considered for the Western Kentucky A Pipeline.
2. Required assessments using current inline inspection tools for the Western Kentucky B lines in 2020.

3. Inline inspections of the Western Kentucky B lines in 2022 using the new dual diameter tool.
4. Future inspections using the dual diameter tool to assess the line.

The following aerial photos depict locations for the recommended 16-inch and 22-inch replacements on the Western Kentucky B pipeline:

Photo 1 – For the Western Kentucky B pipeline the 262-feet of 22-inch pipeline and approximately 0.33 miles of 16-inch pipeline in (4 segments).

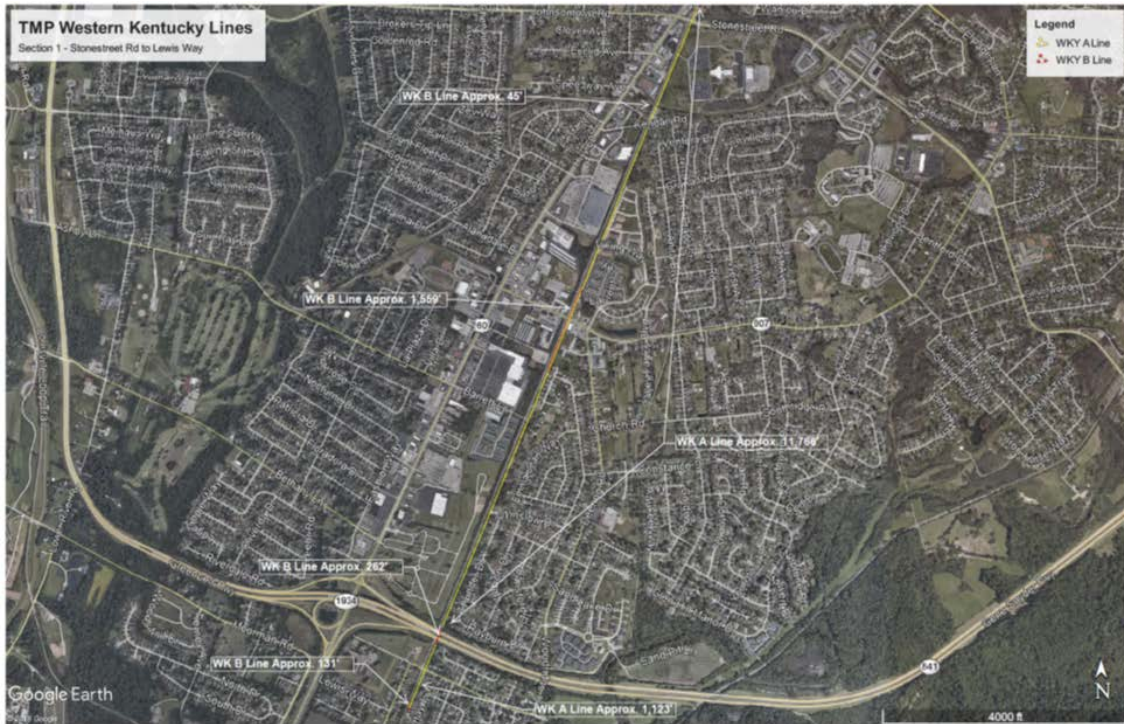


Photo 2 – For the Western Kentucky B pipeline the photo depicts approximately 0.19 miles of 16-inch pipeline recommended to be replaced.



Alternative 1

The first alternative considered includes performing ILIs on each single-diameter section of pipeline. For transmission pipelines like Western Kentucky B line, which has frequent changes in diameter, running ILIs on each individual segment is impractical. To the extent it could be done at all, it would be dramatically more expensive due to inspections being conducted on 12 segments of single-diameter pipeline on the Western Kentucky B gas transmission lines alone. There are 15 diameter changes on the Western Kentucky B pipeline. This alternative assumes that the enhanced tool run would not have to be performed on one of the segments that is expected to be eliminated as part of another project. The short segment of 16-inch pipeline included in this alternative would eliminate two tool runs. These ILIs would be run every seven years in order to comply with PHMSA regulations.

Pipeline Replacements for this alternative would be:

- a. Replace one approximately 45-foot segment of 16-inch pipeline with 20-inch pipeline where the 16-inch pipeline is a short section connecting with 20-inch pipeline at each end.

The summary table above sets forth capital and O&M expenditures for this alternative. The O&M expenditures include:

1. Expenditures to run single diameter enhanced inline inspection tools on the Western Kentucky B line by running them in all segments individually when the diameter changes.
2. Future inspections using the single diameter tool to assess the line.

Alternative 2

A second alternative considered was to replace all segments of 16-inch and 22-inch diameter on the Western Kentucky B pipeline to standardize the pipelines with 20-inch diameter pipe. By doing this, 20-inch single diameter tools could be run on each of these pipelines. The capital replacement costs on the Western Kentucky B pipeline are projected to cost about \$27 million.

Pipeline Replacements for this alternative would be:

- a. Replace all of approximately 4.4 miles of 16-inch pipeline.
- b. Replace the 262-foot section of 22-inch pipeline.

The summary table above provides the capital investment and O&M expenditures associated with this option. The O&M expenditures include:

1. Required assessments using current inline inspection tools for the Western Kentucky B lines in 2020.
2. Enhanced inspections using the single diameter tool in 2022.
3. Future inspections using the single diameter tool to assess the line.

Magnolia 16-inch and 20-inch road crossings

The Magnolia 16-inch pipeline road crossings project consists of replacing the following:

- Six oversized road crossings (20-inch diameter)
- Approximately 0.23 miles of 20-inch pipeline exist at the six road crossings

The Magnolia 20-inch pipeline road crossings consists of the following:

- Two oversized road crossings (24-inch diameter)
- Approximately 0.11 miles of 24-inch pipeline exist at the 2 road crossings

Recommended Option for the Magnolia 16-inch and 20-inch pipelines

LG&E recommends replacing the six oversized sections (20-inch diameter pipeline) of the Magnolia 16-inch pipeline with 16-inch pipeline and two oversized sections (24-inch diameter pipeline) of the Magnolia 20-inch pipeline with 20-inch pipeline. This would allow both Magnolia pipelines to be inspected with single-diameter ILI tools and will minimize the risk of speed excursions by those tools. The total amount of pipe replaced will be approximately 0.23 miles on the Magnolia 16-inch pipeline and 0.11 miles on the Magnolia 20-inch pipeline. The new pipelines will be inserted into the oversized sections being replaced where possible. New crossings will be installed either by trenching or conventional bore in any locations where the existing crossing is unsuitable for use as a casing pipe. There is one location near New Glendale Rd where the pipeline route may be straightened out to eliminate a 90° elbow on both pipelines. This would be additional footage on the Magnolia 20-inch pipeline but would eliminate one of the oversized segments of the Magnolia 16-inch pipeline.

The table below summarizes the capital investment and expenditures for the recommended option and alternatives along with a new present revenue requirement.

Option	Capital Investment (\$ millions)	O&M Expenditures (\$ millions)	NPVRR (\$ million)
Recommended	\$5.9	\$97.3	\$30.0
Alternative 1	\$0.0	\$152.0	\$37.1
Alternative 2	\$0.0	\$114.8	\$32.7

For purposes of this analysis, assumed O&M expenditures for the recommended option include:

1. Required assessments using current inline inspection tools for the Magnolia 16-inch Line in 2019. Circumferential magnetic flux leakage (MFL-C) and electromagnetic acoustic transducer (EMAT) tools will not collect data on the 20-inch sections recommended for replacement.
2. Required assessments using current (single-diameter) inline inspection tools for the Magnolia 20-inch Line in 2021.
3. Future inspections using single diameter tools to assess the lines.

The following aerial photos depict locations for the recommended oversized road crossing replacements on the Magnolia Lines:

Photo 1: The photo depicts crossings on both Magnolia Lines to be replaced under Lincoln Pkwy, south of Roundtop Rd.



Photo 2: The photo depicts crossings on both Magnolia Lines to be replaced under Lincoln Pkwy, north of Harvest Dr



Photo 3: The photo depicts three crossings on the Magnolia 16-inch Line to be replaced in the vicinity of New Glendale Rd near the Western Kentucky Pkwy. The photo also depicts the location of a section of the Magnolia 20-inch line where a 90° ell is to be cut out and the pipeline route straightened.



Photo 4: The photo depicts a crossing on the Magnolia 16-inch Line to be replaced under Old Mill Rd.

Alternative 1

The first alternative considered is to inspect the Magnolia 16-inch Line using the multi-diameter inline inspection tools being developed for use in the Western Kentucky Lines, and to run separate inline inspections on each size pipe in the Magnolia 20-inch Line. To the extent this is possible, both ends of each 24-inch section of the Magnolia 20-inch Line would have to be excavated each time an inspection was scheduled, and tethered ILI tools pulled through the pipe. This alternative would require 2019 expenditures towards engineering the replacement of the oversized sections to be reclassified from CAPEX to OPEX. Inspections would be repeated every seven years to comply with PHMSA regulations.

The summary table above shows the capital and O&M expenditures for this alternative. The O&M expenditures include:

1. Required assessments using current inline inspection tools for the Magnolia 16-inch Line in 2019. MFL-C and EMAT tools will not collect data on the 20-inch sections recommended for replacement.
2. Reclassification in 2020 of 2019 project expenditures from CAPEX to OPEX.
3. Inspection of the Magnolia 16-inch Line in 2021 using multi-diameter MFL-C and EMAT tools.
4. Required assessments using current (single-diameter) inline inspection tools for the Magnolia 20-inch Line in 2021.
5. Future inspections using multi-diameter tools to assess the Magnolia 16-inch Line and single diameter tools to assess the Magnolia 20-inch Line.

Alternative 2

A second alternative considered was to inspect the Magnolia 16-inch Line using the multi-diameter inline inspection tools being developed for use in the Western Kentucky Lines, and to develop similar tools capable of inspecting the 20-inch and 24-inch segments of the Magnolia 20-inch Line. This alternative would require 2019 expenditures towards engineering the replacement of the oversized sections to be reclassified from CAPEX to OPEX.

The summary table above shows capital and O&M expenditures for this alternative. The O&M expenditures include:

1. Required assessments using current inline inspection tools for the Magnolia 16-inch Line in 2019. MFL-C and EMAT tools will not collect data on the 20-inch sections recommended for replacement.
2. Reclassification in 2020 of 2019 project expenditures from CAPEX to OPEX.
3. Development in 2020-2021 of the multi-diameter (20-inch x 24-inch) inline inspection tools.
4. Inspection of the Magnolia 16-inch Line in 2021 using multi-diameter MFL-C and EMAT tools.
5. Required assessments using multi-diameter inline inspection tools for the Magnolia 20-inch Line in 2021.
6. Future inspections using multi-diameter tools to assess the lines.

LG&E Western Kentucky A Line Segments

Segment	Diameter (inches)	Segment Length (feet)
1	16	18,310
2	20	13,086
3	22	1,946
4	20	59
5	22	9,761
6	20	359
7	22	1,123
8	20	3,068
9	16	270
10	20	42
11	16	2,757
12	20	617
13	16	420
14	20	5,658
15	16	7,739
16	20	1,743
17	16	4,535
18	20	46,683

LG&E Western Kentucky B Line Segments

Segment	Diameter (inches)	Segment Length (feet)
1	16	49
2	20	33,116
3	16	45
4	20	3,540
5	16	1,559
6	20	4,830
7	22	262
8	20	1,100
9	16	131
10	20	26,899
11	16	16,432
12	20	21,741
13	16	4,148
14	20	3,039
15	16	977