FINANCIAL EXHIBIT

(1) Section 12(2)(a) Amount and kinds of stock authorized.

1,000,000 shares of Capital Stock $15 par value amounting to $15,000,000 par value.

(2) Section 12(2)(b) Amount and kinds of stock issued and outstanding.

585,333 shares of Capital Stock $15 par value amounting to $8,779,995 total par value. Total Capital Stock and Additional Paid-in Capital as of May 31, 2015:

Capital Stock and Additional Paid-in Capital
As of May 31, 2015
($ per 1,000)

Capital Stock	$8,780
Premiums thereon	18,839
Total Capital Contributions from Parent (since 2006)	9,396
Contribution from Parent Company for Purchase of Generation Assets	140,061
Total Capital Stock and Additional Paid-in-Capital	$177,076

(3) Section 12(2)(c) Terms of preference or preferred stock, cumulative or participating, or on dividends or assets or otherwise.

There is no preferred stock authorized, issued or outstanding.

(4) Section 12(2)(d) Brief description of each mortgage on property of applicant, giving date of execution, name of mortgagor, name or mortgagee, or trustee, amount of indebtedness authorized to be secured, and the amount of indebtedness actually secured, together with any sinking fund provision.

Duke Energy Kentucky does not have any liabilities secured by a mortgage.

(5) Section 12(2)(e) Amount of bonds authorized, and amount issued, giving the name of the public utility which issued the same, describing each class separately, and giving the date of issue, face value, rate of interest, date of maturity and how secured, together with the amount of interest paid thereon during the last fiscal year.

The Company has three outstanding issues of unsecured senior debentures issued under an Indenture dated December 1, 2004, between itself and Deutsche Bank Trust Company Americas, as Trustee, as supplemented by two Supplemental Indentures. The Indenture allows the Company to issue debt securities in an unlimited amount from time to time. The Debentures issued under the Indenture are the following:

Supplemental Indenture	Date of Issue	Principal Amount Authorized and Issued	Principal Amount Outstanding	Rate of Interest	Date of Maturity	Interest Paid Year 2014
1st Supplemental	3/7/2006	50,000,000	50,000,000	5.750%	3/10/2016	2,875,000
1st Supplemental	3/7/2006	65,000,000	65,000,000	6.200%	3/10/2036	4,030,000
2nd Supplemental	9/22/2009	100,000,000	100,000,000	4.650%	10/1/2019	4,650,000
			215,000,000			11,555,000

(6) Section 12(2)(f) Each note outstanding, giving date of issue, amount, date of maturity, rate of interest, in whose favor, together with amount of interest paid thereon during the last fiscal year.

Not applicable.

(7) Section 12(2)(g) Other indebtedness, giving same by classes and describing security, if any, with a brief statement of the devolution or assumption of any portion of such indebtedness upon or by person or corporation if the original liability has been transferred, together with amount of interest paid thereon during the last fiscal year.

The Company has two series of Pollution Control Revenue Refunding Bonds issued under a Trust Indenture dated as of August 1, 2006 and a Trust Indenture dated as of December 1, 2008, between the County of Boone, Kentucky and Deutsche Bank National Trust Company as Trustee. The Company's obligation to make payments equal to debt service on the Bonds is evidenced by a Loan Agreement dated as of August 1, 2006 and December 1, 2008 between the County of Boone, Kentucky and Duke Energy Kentucky. The Bonds issued under the Indentures are as follows:

Indenture	Date of Issue	Principal Amount Authorized and Issued	Principal Amount Outstanding	Rate of Interest	Date of Maturity	Interest Paid Year 2014
Series 2008A	12/01/2011	50,000,000	50,000,000	1.05% [1]	8/1/2027	527,295
Series 2010	11/24/2010	26,720,000	26,720,000	0.05%[2]	8/1/2027	14,107
			76,720,000			541,402

[1] The interest rate represents the average floating-rate of interest on the bonds for 2014. The interest rate on the bonds resets on the first day of every month based on 75% of the sum of one month and spread of 1.25%.

[2] The interest rate on the bonds resets every 7 days through an auction process. The variable-rate debt was swapped to a fixed rate of 3.86% for the life of the debt.

The Company has issued and has outstanding as of May 31, 2015 the following capital leases:

Series	Date of Issue	Principal Amount Authorized and Issued	Principal Amount Outstanding	Rate of Interest	Date of Maturity
2006	12/28/2006	2,406,336	569,222	5.000	12/30/2015
Erlanger	12/30/2006	2,100,000	1,082,128	8.634	09/30/2020
2007	12/31/2007	3,066,955	1,063,187	5.115	12/31/2016
2009	04/21/2009	3,429,432	1,551,507	4.821	04/21/2018
2010	06/18/2010	955,061	527,427	3.330	06/18/2019
		11,957,784	4,793,471		

The Company also has outstanding as of May 31, 2015, $25,000,000 of money pool borrowings, which is classified as Long-Term Debt payable to affiliated companies. This obligation, which is short-term by nature, is classified as long-term due to Duke Energy Kentucky's intent and ability to utilize such borrowings as long-term financing.

(8) Section 12(2)(h) Rate and amount of dividends paid during the last five (5) previous fiscal years, and the amount of capital stock on which dividends were paid each year.

DIVIDENDS PER SHARE

Year Ending	Per Share	Total	No. of Shares	Par Value of Stock
December 31, 2010	0.00	0	585,333	8,779,995
December 31, 2011	230.64	135,000,000	585,333	8,779,995
December 31, 2012	17.08	10,000,000	585,333	8,779,995
December 31, 2013	68.34	40,001000	585,333	8,779,995
December 31, 2014	0.00	0	585,333	8,779,995

(9) Section 12(2)(i) Detailed Income Statement and Balance Sheet

See the attached pages for the detailed Income Statement for the twelve months ended May 31, 2015 and the detailed Balance Sheet as of May 31, 2015.

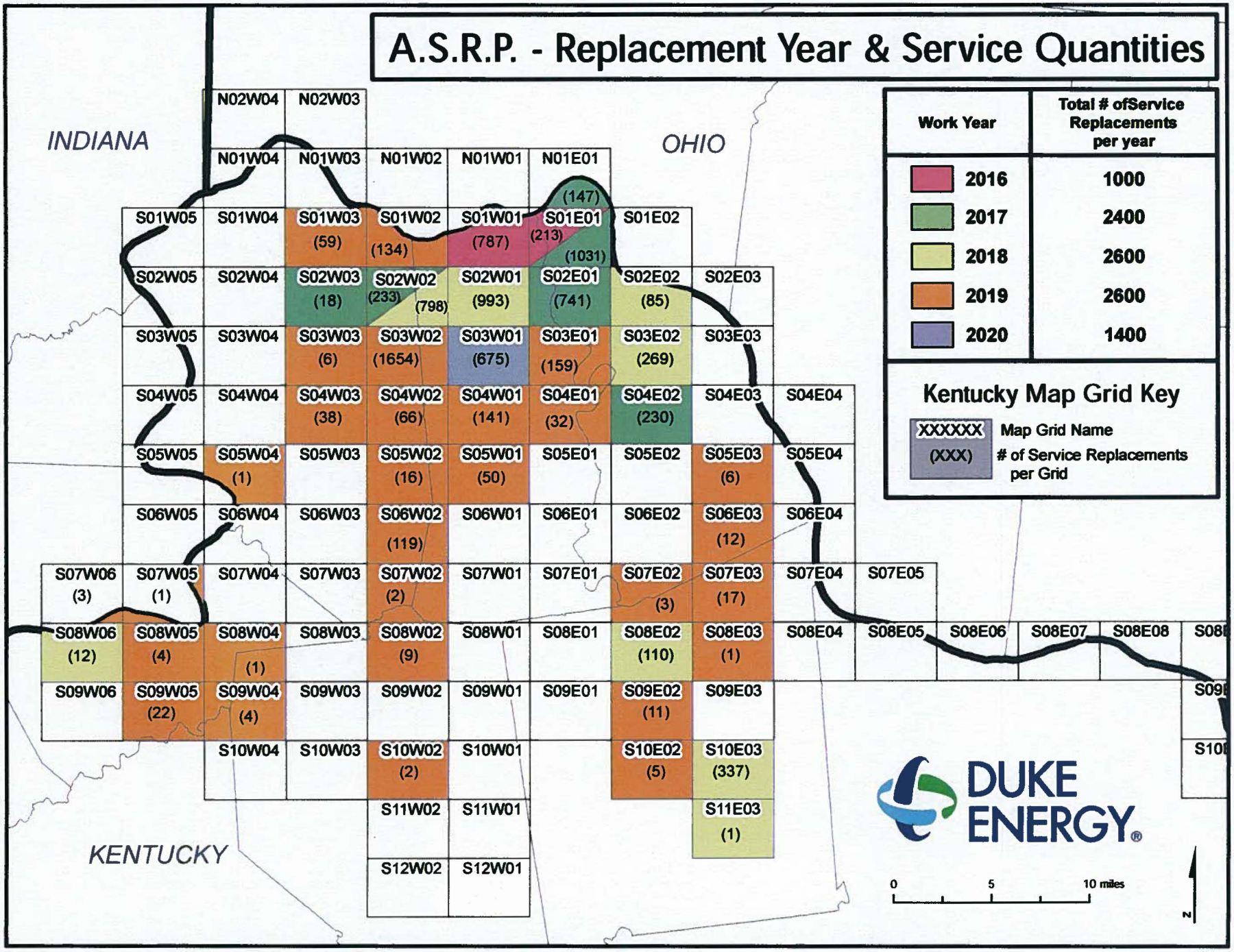
DUKE ENERGY KENTUCKY, INC.
CONDENSED STATEMENTS OF OPERATIONS
(Unaudited)
(In thousands)

	Twelve Months Ended May 31 2015
Operating Revenues	
Electric	372,418
Gas	116,536
Total operating revenues	488,954
Operating Expenses	
Fuel used in electric generation and purchased power	161,626
Natural gas purchased	52,011
Operation, maintenance and other	129,196
Depreciation and amortization	46,611
Property and other taxes	13,787
Goodwill and other impairment charges	-
Total operating expenses	403,231
Gains on Sales of Other Assets and Other, net	234
Operating Income	85,957
Other Income and Expenses, net	1,361
Interest Expense	15,543
Income Before Income Taxes	71,775
Income Tax Expense	26,187
Income From Continuing Operations	45,588
Income From Discontinued Operations, net of tax	-
Net Income	45,588

Other Reporting

Duke Energy Kentucky, Inc.
Consolidated Balance Sheet
Year-to-Date
(Unaudited)

(In whole dollars)	May 2015	December 2014
ASSETS		
Cash and Cash Equivalents	6,860,272	11,306,908
Receivables	2,202,432	2,247,842
Receivables from affiliated companies	5,754,697	25,566,861
Notes receivable from affiliated companies	9,309,000	-
Inventory	44,359,371	52,899,948
Regulatory Assets	6,294,252	5,991,030
Other	28,224,054	31,551,269
Total Current Assets	103,004,077	129,563,858
Intangibles, net	37,024	43,584
Other	10,633,096	5,858,474
Total Investments and Other Assets	10,670,119	5,902,058
Cost	2,049,903,930	1,711,836,164
Less Accumulated Depreciation and Amortization	$ (898,193,291)	$ (691,367,071)
Generation Facilities To Be Retired	-	8,600,936
Net Property Plant and Equipment	1,151,710,640	1,029,070,030
Regulatory Assets	51,224,617	47,693,522
Other	1,870,256	1,928,034
Total Regulatory Assets and Deferred Debits	53,094,873	49,621,555
Total Assets	$ 1,318,479,709	$ 1,214,157,502
LIABILITIES AND EQUITY		
Accounts Payable	15,696,201	22,578,230
Accounts payable to affiliated companies	13,498,154	13,262,610
Notes payable to affiliated companies	-	37,609,000
Taxes Accrued	10,883,630	14,483,067
Interest Accrued	2,390,615	3,346,483
Current Maturities of Long-Term Debt	51,526,195	1,615,463
Regulatory Liabilities	7,003,545	984,598
Other	20,990,359	17,364,508
Total Current Liabilities	121,988,698	111,243,958
Long-Term Debt	244,568,516	295,802,462
Notes payable to affiliated companies	25,000,000	25,000,000
Deferred Income Taxes	275,689,013	271,307,802
Investment Tax Credit	1,008,079	1,094,869
Accrued Pension and Other Post-Retirement Benefit Costs	10,099,705	9,469,416
Asset Retirement Obligations	124,302,578	8,122,285
Regulatory Liabilities	51,881,788	52,729,872
Other	26,338,049	26,130,907
Total Deferred Credits and Other Liabilities	489,319,212	368,855,151
Common Stock	8,779,995	8,779,995
Additional Paid in Capital	168,295,832	167,494,135
Retained Earnings	260,527,456	236,981,801
Equity	437,603,282	413,255,931
Total Liabilities and Common Stockholders' Equity	$ 1,318,479,709	$ 1,214,157,502


A.S.R.P. - Replacement Year & Service Quantities
INDIANA
OHIO
KENTUCKY
N02W04
N02W03
N01W04
N01W03
N01W02
N01W01
N01E01
(147)
S01W05
S01W04
S01W03
(59)
S01W02
(134)
S01W01
(787)
S01E01
(213)
(1031)
S01E02
S02W05
S02W04
S02W03
(18)
S02W02
(233)
(798)
S02W01
(993)
S02E01
(741)
S02E02
(85)
S02E03
S03W05
S03W04
S03W03
(6)
S03W02
(1654)
S03W01
(675)
S03E01
(159)
S03E02
(269)
S03E03
S04W05
S04W04
S04W03
(38)
S04W02
(66)
S04W01
(141)
S04E01
(32)
S04E02
(230)
S04E03
S04E04
S05W05
S05W04
(1)
S05W03
S05W02
(16)
S05W01
(50)
S05E01
S05E02
S05E03
(6)
S05E04
S06W05
S06W04
S06W03
S06W02
(119)
S06W01
S06E01
S06E02
S06E03
(12)
S06E04
S07W06
(3)
S07W05
(1)
S07W04
S07W03
S07W02
(2)
S07W01
S07E01
S07E02
(3)
S07E03
(17)
S07E04
S07E05
S08W06
(12)
S08W05
(4)
S08W04
(1)
S08W03
S08W02
(9)
S08W01
S08E01
S08E02
(110)
S08E03
(1)
S08E04
S08E05
S08E06
S08E07
S08E08
S08
S09W06
S09W05
(22)
S09W04
(4)
S09W03
S09W02
S09W01
S09E01
S09E02
(11)
S09E03
S09
S10W04
S10W03
S10W02
(2)
S10W01
S10E02
(5)
S10E03
(337)
S10
S11W02
S11W01
S11E03
(1)
S12W02
S12W01
Work Year
Total # ofService Replacements per year
2016
1000
2017
2400
2018
2600
2019
2600
2020
1400
Kentucky Map Grid Key
XXXXXX
Map Grid Name
(XXX)
# of Service Replacements per Grid
DUKE ENERGY®
0
5
10 miles
N

Specifications for Duke Energy 2016 Kentucky Accelerated Service Replacement Program

Duke Energy

April 29, 2015

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1.0 General Accelerated Service Replacement Program (A.S.R.P.) Information

1.1 Scope of Work

Duke Energy Kentucky, Inc., (Duke Energy Kentucky or the Company) initiated a program in 2013 to replace metallic unprotected services in its Kentucky service territory. The projected completion year for the program is 2020.

The total project will consist of the replacement of approximately 10,000 services residential and commercial. Work will be required in most communities within the service territory and will be more specifically identified with each year's work. Service areas will be broken into regions consisting of approximately 1,000 to 3,000 services. The installation will be performed by either company crews or contractor work forces.

Duke Energy Kentucky reserves the right to remove any portion of a project as deemed necessary. This will mainly occur due to upcoming street improvements or budget constraints.

Duke Energy Kentucky reserves the option to impose a 10% retainer to all invoices for contractor work force projects. If the retainer is imposed, the gas contractor will be notified prior processing the invoice.

1.2 Standards and Procedures

All facilities must be installed in accordance with this specification, Duke Energy Kentucky's Gas Division specification GD–150 composite, CFR part 192, Duke Energy Kentucky's Gas Standards, and all other applicable industry codes and standards.

1.3 Safety

Safety is very important to Duke Energy Kentucky. It is the Company's and contractor's responsibility to insure that all their employees are working in a safe manner. This includes following all Duke Energy Kentucky's standards and procedures as well as Company's Gas Operations "Keys to Life" which includes but not limited to, Driving Safely, Pre-job Briefings, Hazardous Energy Isolation, Personal Protective Equipment, Work Zone Safety, Confined Space Entry, Trenching/Excavation and Natural Gas Safety. Duke Energy Kentucky will periodically be doing Human Performance Audits throughout the project to ensure the workforce is maintaining a safe work site for its employees and the surrounding public.

If a block of sidewalk is to be open for more than 48 hours, class 53 temporary asphalt must be placed into the open section of sidewalk. All tripping hazards are to be avoided in sidewalk areas and where necessary foot traffic shall be re-routed where a sidewalk blockage is present.

1.4 Contractor Identification

{ TC "1.5 Contractor Identification" \f C \l "2" }
All Company and contractor employees must wear an ID at all times and the ID must be visible. The ID must have a picture of the employee, the employee's name as well as the Company's or Contractor's name and logo, as applicable.

All contractors' vehicles or personal vehicles used to complete the project must have the contractor's name and logo on them.

1.5 Documentation

When contractor workforce is performing work, the contractor will be required to provide the contractor construction management supervisor with a weekly report of the proposed scheduled work, the completed work from the prior week and the contact numbers for the coordinator and crew leaders.

On a daily bases, the contractor must contact the assigned Duke Energy Kentucky Inspector and provide him or her with a location sheet for each crew. Arrangements must be made between the contractor and Inspector as to having the list either electronically submitted or faxed.

The contractor must also provide the Engineering Sponsor, every Monday by 5pm, an electronic list of services completed from the prior week.

The contractor will be required to turn in a ***properly completed*** JCF in order to be paid. Each Job Control Form should be filled out by the contractor and turned in to the inspector weekly.

1.6 Customer/Municipality Notification

{ TC "1.6 Customer/Municipality Notification" \f C \l "2" }
The customer is to be notified by hanging door cards two (2) weeks in advance of performing work.

Duke Energy Kentucky will provide door cards. When a contractor is used, the contractor will provide a label acceptable to Duke Energy Kentucky to be placed on the door card. The contractor will place the label on the door card. The label will have the contractor's name, logo and contractor contact information (phone number and person's name).

The Company or contractor, depending on who is performing the work, is responsible for notifying all municipalities prior to starting work.

The Company or contractor must set up appointments with all commercial customers depending on who is performing the work. Once the appointment is made the contractor must contact the appropriate Duke Energy Customer Service Supervisor to schedule a time for a Duke Energy Kentucky Customer Service crew to be on site.

1.7 Permits

All permits for the service renewal work will be obtained by Duke Energy Kentucky and will be provided to the appropriate entity performing the work prior to the renewal of each service. Duke Energy Kentucky will pay all permit fees except cut/fill fees. All damage to trees and landscaping will be corrected by the party completing the work unless the damage was a result of a direct order by a Duke Energy Kentucky employee.

1.8 Customer Complaints

{ TC "1.7 Customer Complaints" \f C \l "2" }
Customer complaints regarding a Company or contractor crew, unsafe working conditions or public safety concerns must be addressed immediately. All other customer complaints must be responded to within 24 hours of receiving the complaint.

2.0 Materials

2.1 Duke Energy Kentucky Supplied Materials

Duke Energy Kentucky will provide all piping and associated pipe materials required for the service replacement work.

2.2 Contractor Supplied Materials

If the contractor is performing the work, the gas contractor is required to provide all materials and equipment other than as indicated on the construction drawings for large services or identified in the Duke Energy Kentucky Gas Standards. Spray paint used for marking must be water soluble and capable of being removed if needed. CDF, CLSM or Flashfill must meet the specifications of the appropriate governing agency (KDOT specifications).

3.0 Accelerated Service Replacement Program (A.S.R.P.) Renewals

Duke Energy Kentucky will provide a list of services to be renewed and it will be the Company or contractor's responsibility to complete these before the date specified. Service work between November 1st and March 31st must be limited to work that can be scheduled with the customer.

The services identified for A.S.R.P. have been pulled based on Duke Energy Kentucky's records. If the assigned entity goes out to the job and determines that the service has already been renewed, a JCF must be filled out.

Duke Energy Kentucky's responsibilities:

- Sending work to the Company Crews or contractor
- Getting permits
- Providing a list of services that need to be complete
- Providing drawings for large diameter services
- Filling out pay sheets for the contractor workforce once JCFs have been received

Responsibilities of the crews performing the work are as follows :

- Pre/Post Camera work (assume costs in M-C Long side drill & in C-M drill)
- Calling in locates
- Renewing or abandoning services
- Moving the meters outside where practicable
- Test and Tap
- Relights – on services that are tapped by the contractor

- Completing the JCF and turning them into the inspector at the weekly sign out.

3.1 Main to Curb (M-C) Service Renewals

When contractors are performing the work, the contractor will be paid a M-C and a C-M service where applicable, based on the installation method. No additional compensation will be paid for exposing or backfilling the gas main and 3rd party utilities. The cost to expose all 3rd party utilities should be built into the bid price for installing the M-C portion of the service. The contractor will be compensated for shoring for any holes over the main that are deeper than 5-ft or as deemed necessary by the competent person on-site, on a T&M basis. When company crews are performing work, the crews charge appropriately for performing the work.

Hard surface restoration will be bid whether Company crews or contractor crews are performing the work and paid as a line item bid unit.

The entity performing the work will be responsible for relights 24-hours a day, 7 days a week except on holidays, which will be handled by company crews. Test and Re-lights should be included in the price of the C-M.

3.2 Curb to Meter (C-M) Service Renewals

If the contractor workforce performs the work, C-M installations will be paid based on the construction method, direct bury, directional drill or insertion. Additional footage (footage over 70-ft) will be paid based on the installation method. If Company crews perform the work, the actual time the will be charge to the project.

Hard surface restoration will be bid whether company crews or contractor crews are performing the work and paid as a line item bid unit.

The entity performing the work will be responsible for relights 24-hours a day, 7 days a week except on holidays, which will be handled by company crews.

3.3 Feeder Line Services

If the contractor performs the work, the contractor will be responsible for installing, pressure testing and building the first stage regulators for feeder line services under 2". Duke Energy's C&M crew will be responsible for the tap and relight. The contractor will just be responsible for installing services 2" and larger and Duke Energy will be in charge of testing, welding, building the first stage regulator, tapping the main and relighting the customers appliances. If company work force performs the work, then the company will be responsible for all task associated with the work.

3.4 Abandonments

Curb services (services previously abandoned at the shut-off valve) will need to be abandoned at the main.

Duke Energy Kentucky's responsibilities:

- Sending work to the contractor
- Getting permits
- Filling out pay sheets once JCFs and Job Cards have been received

Responsibilities of the crews performing the work are :

- Calling locates
- Performing the abandonment
- Turning in the JCF within a week

4.0 Pre/Post Camera

Pre/Post camera will be required and will be the responsibility of the entity performing the work.

5.0 Meter Move Outs

Inside meters are to be moved outside when possible. In some cases, the meters cannot be relocated based on historical districts, permitting agency requirements, etc. The company or contractor should make this determination prior to taking the customer out of service.

6.0 Anodes{ TC "7.0 INVOICING" \f C \l "1" }

Installation of anode will be required for all services installations that will be attached to an existing steel main.

7.0 Road Plates

Excavations will be plated until all work is complete.

8.0 Completion of Work{ TC "6.0 COMPLETION OF WORK" \f C \l "1" }

No work shall be completed unless it is accepted by the authorized agent of the contractor and the authorized agent of Duke Energy Kentucky. Work must comply with the work plan submitted. The work will be considered complete when the service is installed, the work area has been restored and the JCF's have been turned in.

9.0 Invoicing{ TC "7.0 INVOICING" \f C \l "1" }

If the work is performed by a contractor, the contractor shall meet with the contractor Construction Management Inspector once a week to complete sign off sheets on all projects (preferably Friday evening or Monday morning). The Inspector's copy is immediately forwarded to the Duke Energy Kentucky invoice desk. The contractor **MUST** turn in all paperwork, JCFs, when signing out on the weekly pay sheets. Any work that does not have the accompanied JCF cannot be signed out until all the paperwork is ready to be turned in. All paperwork returned for corrections must be returned within a week. This is to make sure Duke Energy Kentucky is keeping up-to-date records on service work. If the contractor fails to meet

this requirement, Duke Energy Kentucky reserves the right to take away this service work until the paperwork is caught up.

Final Report

Condition Analysis of Kentucky Service Lines

Prepared for

Duke Energy Kentucky, Inc.

July 2, 2015

LUMMUS CONSULTANTS
INTERNATIONAL

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Lummus Consultants International, Inc. (Lummus Consultants), through its legacy companies, including Stone & Webster Management Consultants, Inc. and Shaw Consultants International, Inc., has a history of over 100 years of providing engineering, construction, and consulting services to the energy industry. Stone & Webster Management Consultants was part of Stone & Webster, Inc., a preeminent engineering and construction firm established in 1889 that specialized in the energy industry. Stone & Webster, Inc. was purchased by The Shaw Group in 2000, and subsequently Stone & Webster Management Consultants, Inc. was renamed Shaw Consultants International, Inc. In February 2013, the Shaw Group was acquired by Chicago Bridge & Iron Company N.V. (CB&I) (NYSE: CBI). The combination of CB&I and The Shaw Group under the CB&I brand creates one of the world's largest engineering, construction, and consulting companies focused on the global energy industry. Shaw Consultants has become Lummus Consultants International, Inc., an independent company in CB&I's Lummus Technology operating group.

Lummus Consultants provides technical advisory and due diligence services to investment firms, project developers, and plant owners in the power, gas delivery, process, petrochemical, and refining industries. Our services include:

- Independent Lenders' Engineer / Technical Review
- Project Identification and Development
- Operating Portfolio Review and Optimization
- Financial Model Development and Review
- Performance Projections
- Environmental Compliance and Planning
- Contracts Review
- Condition Assessment and Replacement Programs Review
- Owner's Engineer
- Technology Assessment and Project Feasibility
- Remaining Life Evaluations
- O&M and Capital Expenditures Assessments
- Fleet Benchmarking and Analysis
- Construction and Operations Monitoring
- Transmission Interconnection and Expansion Plans
- Testimony

ACRONYMS, ABBREVIATIONS, AND UNITS

The following table is a listing of acronyms, abbreviations, and measurement units used in this report.

List of Acronyms and Abbreviations	
Acronym	**Name**
ADB	Advisory Bulletin
AGF	All Gas Facilities
AIRP	Accelerated Infrastructure Replacement Program
AMRP	Accelerated Mains Replacement Program
APRP	Accelerated Pipe Replacement Plan
ASRP	Accelerated Service Line Replacement Program
CIMOS	Cast Iron Maintenance Optimization System
C-M	Curb to Meter portion of Service Line
CP	Cathodic Protection
DIMP	Distribution Integrity Management Plan
DOT	U.S. Department of Transportation
EGIS	Enterprise Geographical Information System
HCA	High Consequence Area
HP	High Pressure
IP	Intermediate Pressure
LDC	Local Distribution Company
M&R	Meter and Regulator
M-C	Main to Curb Portion of Service Line
MP	Medium Pressure
NARUC	National Association of Regulatory Utility Commissioners
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
KPSC	Public Service Commission, Commonwealth of Kentucky
SME	Subject Matter Experts
SP	Standard Pressure
TIMP	Transmission Integrity Management Plan
ULH&P	Union Light, Heat & Power Company

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1 Executive Summary

1.1 Introduction

Lummus Consultants International, Inc. (Lummus Consultants) was retained by Duke Energy Kentucky, Inc. (Duke Energy Kentucky) to analyze the leak history on the service lines in its service territory. The purpose of the review was to:

- Determine the current condition of the service lines;
- Identify any issues Duke Energy Kentucky is having with their service lines;
- Identify the cause of the service line issues;
- Identify the extent of the service line issues *(i.e.*, safety issues); and
- Determine whether an accelerated service line replacement program (ASRP) is reasonably needed.

Lummus Consultants performed an independent third-party review of the service lines in the Kentucky service territory encompassing, among other factors, the leak history associated with those service lines, the types of piping material involved in the leaks, and the causes of the leaks in those service lines.

Lummus Consultants, through its legacy companies, including Stone & Webster Management Consultants, Inc. and Shaw Consultants International, Inc. has a history of over 100 years of providing engineering, construction, and consulting services related to the energy industry. There is no phase related to the transportation and distribution of natural gas that has not been handled fully and satisfactorily by Lummus Consultants from the earliest days of manufactured gas to the modern era of transcontinental and international gas projects. Lummus Consultants participated in the development of the Texas Gas Transmission, Transcontinental Pipeline Company, and TransCanada Pipeline Company systems. These assignments began with the original market analysis through regulatory hearings to construction and operation. Furthermore, Lummus Consultants has extensive experience in natural gas distribution.

Lummus Consultants has engineers with experience working with gas utilities in areas including consulting, design, procurement, and construction management services. Lummus Consultants was selected to provide consulting services in conjunction with the potential acquisition of the gas and electric utility in Montana by Babcock & Brown, the pipeline assets owned by El Paso Merchant Energy by WestLB, and most recently the gas utility in New Mexico. We have completed assignments for Duke Energy Ohio, Vectren, Columbia Gas of Kentucky, Columbia Gas of Pennsylvania, Cinergy, Iroquois, Con Edison, KeySpan, WE Energy, Tennessee and Gulfstream. Our work for Cinergy, Vectren, Columbia Gas of Kentucky, and Columbia Gas of Pennsylvania included an independent technical review of the gas distribution system condition with recommendations for their replacement strategy. As part of our review, we researched utilities that have undergone replacement programs and regulatory bodies that have reviewed proposals within or outside of rate cases. We have compared our clients' replacement strategies to similar industry peers. Our independent reports have been used to support our clients' replacement strategy documentation for rate case purposes.

1.2 Overview

Duke Energy Kentucky was formerly Union Light, Heat & Power Company (ULH&P). In 1994 Cincinnati Gas & Electric Company and its Kentucky subsidiary ULH&P were merged with Plainfield,

Indiana-based PSI Energy (Public Service Indiana) to create Cinergy, an energy company based in Cincinnati, Ohio. In 2006 Cinergy was acquired by Charlotte, North Carolina-based Duke Energy Corporation (Duke Energy).

Duke Energy Kentucky and its predecessor gas distribution companies have served portions of northern Kentucky (including Boone, Campbell, Gallatin, Grant, Kenton and Pendleton counties) for more than 100 years. Originally gas customers were provided manufactured gas made locally from coal. In 1909, a 183-mile 20-inch pipeline was constructed bringing natural gas to, and through, Covington, Kentucky from West Virginia gas fields, replacing the manufactured gas. The line was constructed by Columbia Gas System, another previous owner of ULH&P.

This review consists of an analysis of Duke Energy Kentucky's service lines in the former ULH&P service territory for the purpose of developing an independent opinion on the current condition of the lines, whether a portion of the service lines should be considered for replacement, and whether an accelerated replacement program would be appropriate for the targeted service lines. The Kentucky service territory includes approximately 96,000 service lines that are comprised of steel, copper, plastic, and other materials.

In 2010, Duke Energy Kentucky completed a ten-year Accelerated Main Replacement Program (AMRP) in its service territory. The AMRP primarily replaced distribution mains and portions of (or entire) higher-risk[1] service lines attached to the replaced mains. The AMRP was successful in reducing leaks on mains; however Duke Energy Kentucky is now observing an increase in the number of leaks on its service lines. Based on the new regulations regarding Distribution Integrity Management Programs (DIMPs), Duke Energy Kentucky and other local distribution companies (LDCs) are being asked to rank threats to their systems and to structure a plan to handle each potential threat.

1.3 Findings and Conclusions

Lummus Consultants analyzed the leak trends following the replacement of mains and associated service lines in Duke Energy Kentucky's distribution piping system under the AMRP. Lummus Consultants also independently reviewed Duke Energy Kentucky's recent DIMP plans and the current inventory of service lines. Both Reported and Repaired leaks on Duke Energy Kentucky's service lines were analyzed in detail to determine the number of leaks over the past decade and the specific cause for each type of leak as well as the type of service line material involved. Trends in leaks were further analyzed by cause to determine whether service line leaks resulting from each cause had declined or increased after the period when lines were replaced under Duke Energy Kentucky's AMRP.

A key finding by Lummus Consultants was that the number of service line leaks far exceeded the number of leaks on mains. Also service leaks caused by factors such as corrosion or materials & welds, were not necessarily declining as expected following the AMRP, particularly related to metallic types of pipe materials. In addition, the proportion of "hazardous" leaks appeared to be increasing on service lines. Hazardous leaks are classified Grade 1 leaks, which represents an indication of leakage presenting an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous. Accordingly, we conclude that Duke Energy Kentucky has service line risks that need to be addressed.

[1] Under its AMRP, Duke Energy Kentucky replaced all associated Main to Curb (M-C) services and if the Curb to Meter (C-M) portion of the service was metallic, that portion was also replaced. If the C-M portion was plastic, it underwent pressure tests and was only replaced if it failed the tests.

Lummus Consultants suggests that the key consideration for service line condition and the pipe replacement programs should be the safety risks to the general public, to Duke Energy Kentucky employees and contractors, and to first responders. Risk to the public from natural gas pipe failures is typically the result of, and possibly even the product of, three factors:

1. The integrity or condition of the pipe segment and its propensity for leakage or pipe breaks.
2. The likelihood that natural gas escaping from the pipe may enter occupied areas or buildings. Urban locations do not always have open areas for natural gas to dissipate should the natural gas leak from the pipe main in the street, travel along the path of the service line to buildings, and accumulate there. Natural gas can also leak at any point along the service line from the street to the building (particularly for older service lines).
3. The potential for serious consequence; larger diameter pipes and higher-pressure gas within the pipes raise the stakes considerably for potential serious consequences.

Our analysis of the above three factors is shown in Section 5 of this report. The analysis indicates that there were five factors observed in Duke Energy Kentucky's system that resulted in higher risks on services than on mains:

1. Pipe walls are thinner on service lines
2. Annual number of leaks is higher on service lines
3. Annual number of hazardous leaks is higher on service lines
4. Service line piping is closer to buildings than mains piping
5. Unknown age and unknown material types for many services

In addition, there is one factor resulting in higher risks on mains than on service lines:

1. Mains are larger in diameter than service lines

There are also three factors resulting in comparable risks on service lines and mains:

1. Pipe length for service lines is comparable to pipe length of mains
2. Age of service lines is comparable to age of mains
3. Pressure levels are identical on mains and on service lines

Based on our review of the pipe categories recommended for accelerated replacement programs by the Federal Pipeline and Hazardous Materials Safety Administration (PHMSA), Lummus Consultants concludes that Duke Energy Kentucky's service lines (in particular their metallic service lines) would qualify for accelerated replacement, in adherence to five out of six of PHMSA's priority categories. The ASRP should consider the following:

- Service lines that present the highest risk to the public, taking into consideration factors relating to integrity of the pipe, access to occupied buildings, and likelihood of serious consequences.
- Considering pipe integrity, material types showing the highest leak rates (bare steel and copper) should be replaced with modern materials.
- For safety reasons, we also suggest including coated steel service lines in the replacement program since sufficient cathodic protection during the entire life of the service cannot always be assured.
- Further, considering pipe integrity, service lines having the earliest installation dates should be considered for replacement preferentially, when all other considerations are equal.
- Considering consequences, service lines that have the highest pressures should also be considered for replacement preferentially, when all other considerations are equal.

2 Background

2.1 Approach

Lummus Consultants analyzed the current inventory and leak history on Duke Energy Kentucky's service lines in order to develop an independent opinion regarding:

- Whether Duke Energy Kentucky is having integrity issues with its service lines;
- The cause of any identified service line issues;
- The extent of the identified service line issues; especially whether safety is a concern; and
- The need for an ASRP.

Duke Energy Kentucky provided Lummus Consultants the latest information (through April 2015) on their service lines in its service territory, including such items as location, pressure rating, year installed, pipe diameter, segment length, district, and material. We analyzed the leaks per service line for each different type of pipe material (bare steel, coated but unprotected steel, cathodically protected steel, plastic, copper, and cast iron). We compared the leak data for multiple years (from 2005 to 2014) to analyze its trend. The data included the number of service leaks by cause, as defined by PHMSA standard classifications. The cause of leaks typically is described through categories such as corrosion, material and welds, natural forces, incorrect operations, excavation by others, construction failure, etc. (see Duke Energy Kentucky's standard definitions of leak causes in Appendix B, attached).

2.2 Recent Duke Energy Kentucky AMRP Program

In 2001, the Kentucky Public Service Commission (KPSC) approved Duke Energy Kentucky's proposed ten-year AMRP. Such replacement plans are encouraged by PHMSA and have been approved by the KPSC as proactive measures to improve the safety and reliability of underground piping systems within the state.

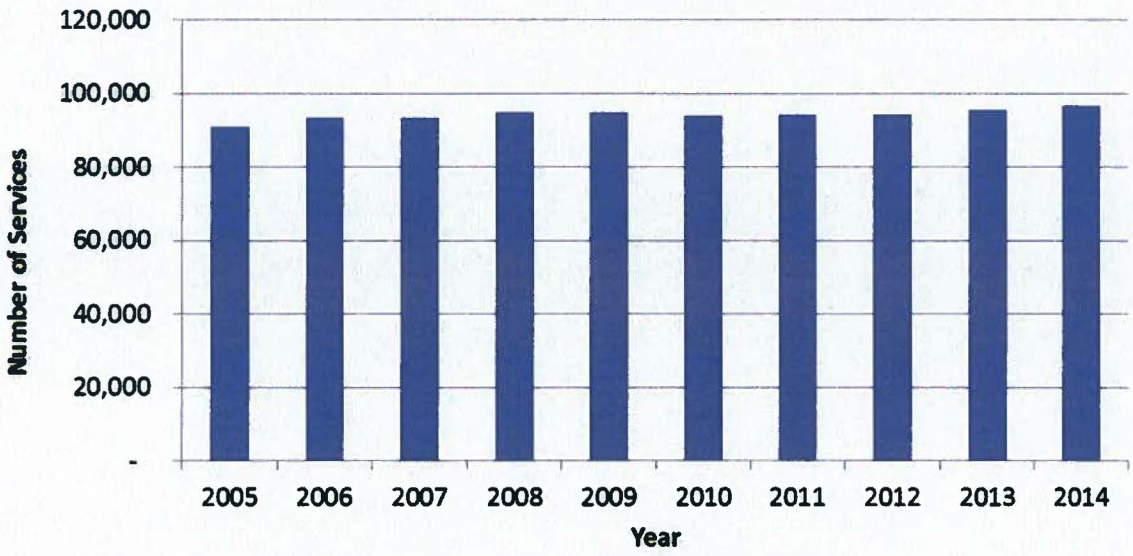
Duke Energy Kentucky's plan included the replacement of higher-risk mains as well as all higher-risk service lines attached to the these mains. The plan did not include the replacement of service lines, which were attached to mains that were not replaced under this program.

Following Duke Energy Kentucky's completion of its AMRP, Duke Energy Kentucky noticed that, although leaks on mains had been successfully decreased, service line leaks in its service area did not decrease in a manner similar to the decrease in leaks on mains.

2.3 Number of Service Lines

The number of customers has increased through the years as the system was expanded. Recent counts of service lines in Duke Energy Kentucky's service area show a slightly increasing trend, as indicated in Figure 1.

Figure 1. Total Number of Duke Energy Kentucky Services (2005-2014)



Data Source: Annual DOT Reports, PHMSA Form 7100.1-1

2.4 Duke Energy Kentucky's Integrity Management Program

Duke Energy Kentucky, as with all other U.S. LDCs, is required (in Federal Code 49 CFR §192.1007) to establish a DIMP covering its distribution piping systems. These regulations require each LDC to conduct the following measures:

- More fully understand its gas system;
- Identify the most significant risks to the system;
- Develop and implement plans that mitigate these risks;
- Measure performance; and
- Continuously improve system performance.

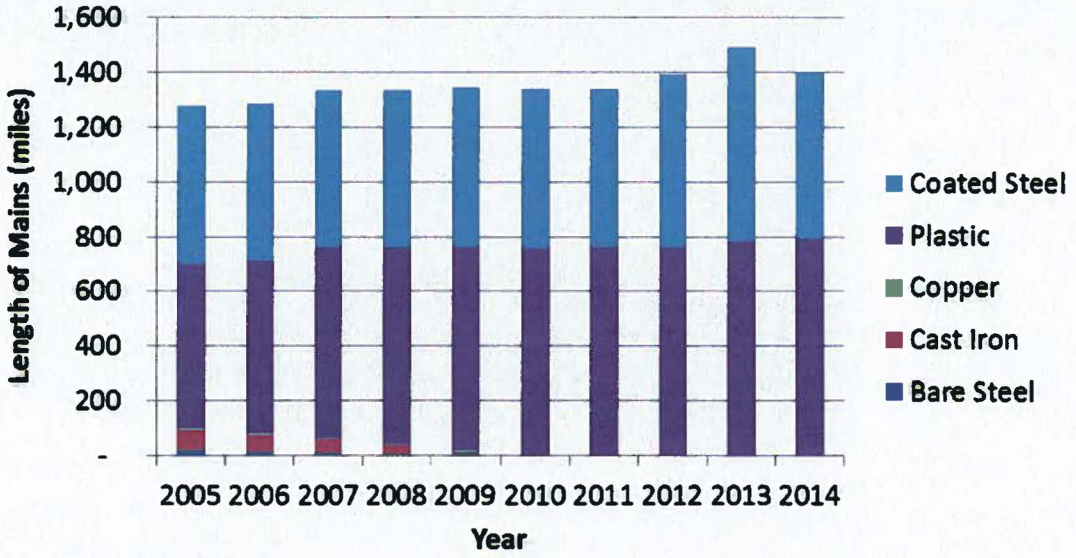
In its DIMP, Duke Energy Kentucky recognizes that managing leaks from its distribution system is an important part of addressing the integrity of its system, and this involves identification and potentially pro-active replacement of certain types of pipes (as guided by its DIMP as well as recommendations from PHMSA) in addition to the repair of leaks when they are found.

3 Historical Trends

3.1 Material-Type Changes in Mains Mileage Due to Replacements

Changes in mains mileage for each type of mains material are shown in Figure 2. The figure shows how the Duke Energy Kentucky AMRP replaced the higher-risk mains pipe (bare steel, cast iron, and copper) with either plastic or coated steel.

Figure 2. Length of Mains by Material Type (2005-2014)

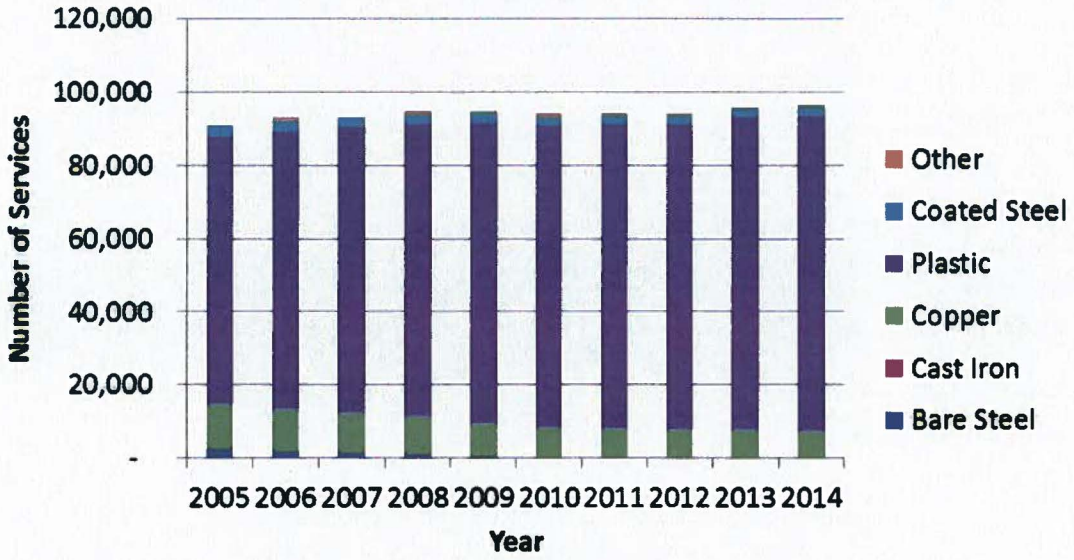


Data Source: Annual DOT Reports, PHMSA Form 7100.1-1

3.2 Service Line Replacements

Figure 3 illustrates the service line materials on a year by year comparison. This figure shows how in addition to the removal of higher-risk mains, large portions of Duke Energy Kentucky's higher-risk service lines have also been removed from its system. This was accomplished primarily through the replacement of service lines that were attached to mains replaced under the AMRP. A small portion of services were also removed through Duke Energy Kentucky's annual replacement policy based on their condition and judged level of obsolescence. However, a significant number of service lines composed of higher-risk materials remain since these were not associated with the mains replacement program or the annual condition replacement program.

Figure 3. Number of Services by Material Type (2005-2014)



Data Source: Annual DOT Reports, PHMSA Form 7100.1-1

3.3 History of Reported Mains Leaks

Figure 4 illustrates the recent reduction in mains leaks as reported in Duke Energy Kentucky's Annual Distribution Reports. This figure shows in the left-hand bars that leaks on mains were successfully reduced during the same years that higher-risk mains materials were being replaced (please refer to Figure 2 for replacement years for higher-risk materials). The right-hand portion of Figure 4 shows that the number of leaks reported on mains has held steady after the end of Duke Energy Kentucky's AMRP program.

Also shown in Figure 4, for years starting in 2010, is a breakdown of leaks into two categories: hazardous and non-hazardous. (Hazardous leaks are defined as Grade one leaks by Department of Transportation (DOT) leak classifications.[2] Grades two and three are classified as non-hazardous.) Figure 4 also shows that the relative proportion of hazardous vs. non-hazardous leaks has been stable for mains. All of these are indications of the success of the AMRP.

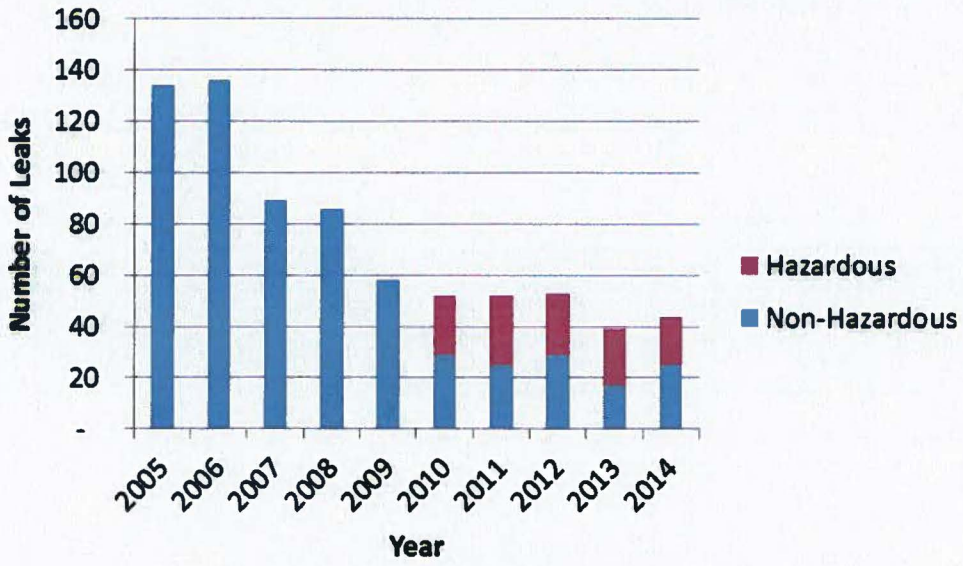
[2] (1) A Grade-one classification represents an indication of leakage presenting an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous.

(2) A Grade-two classification represents an indication of leakage recognized as being nonhazardous at the time of detection, but requires scheduled repair based upon the severity and/or location of the leak.

(3) A Grade-three classification represents an indication of leakage recognized as being nonhazardous at the time of detection and can be reasonably expected to remain nonhazardous.

Duke Energy Kentucky takes a more conservative approach by including leaks that would have fallen into the Grade-three classification as a Grade-two classification.

Figure 4. Reported Leaks on Mains (2005-2014)



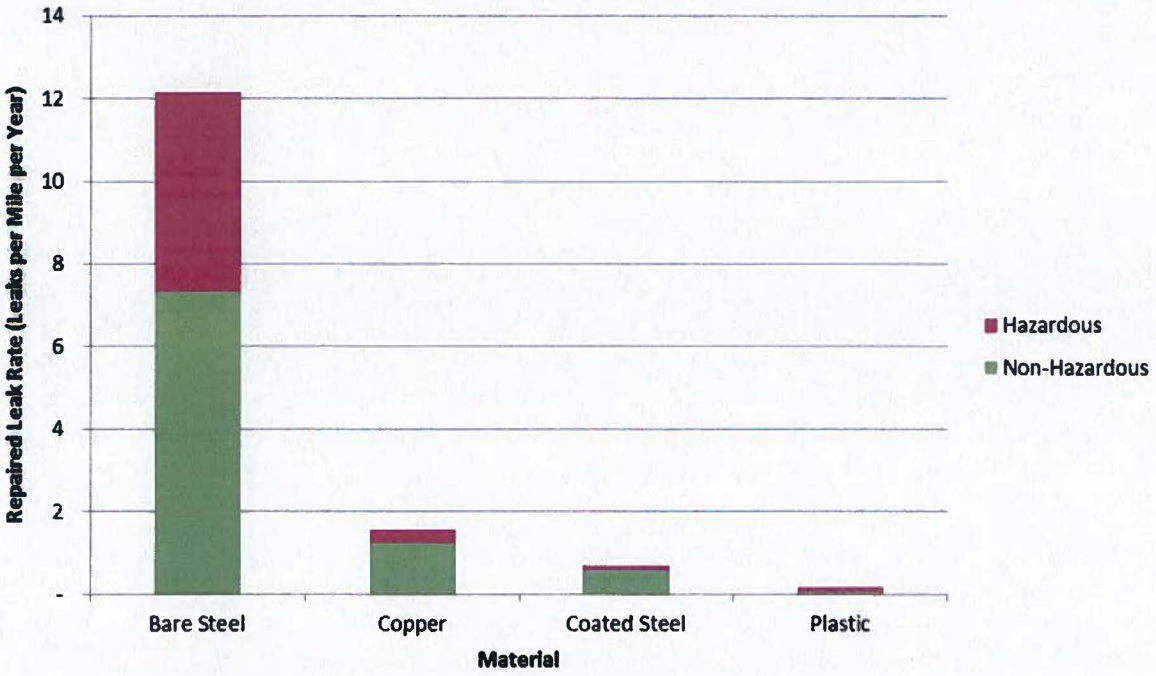
Data Source: Annual DOT Reports, PHMSA Form 7100.1-1

Note: Starting in 2010, gas distribution utilities began reporting their numbers of leaks in two categories: hazardous and non-hazardous, as required by expanded DOT reporting forms.

3.4 Service Line Leak Rates

Figure 5 identifies the average leak rates calculated for Duke Energy Kentucky's service lines in its system for the latest five-year period.

Figure 5. Leak Rates for Services by Material Type (2010-2014)



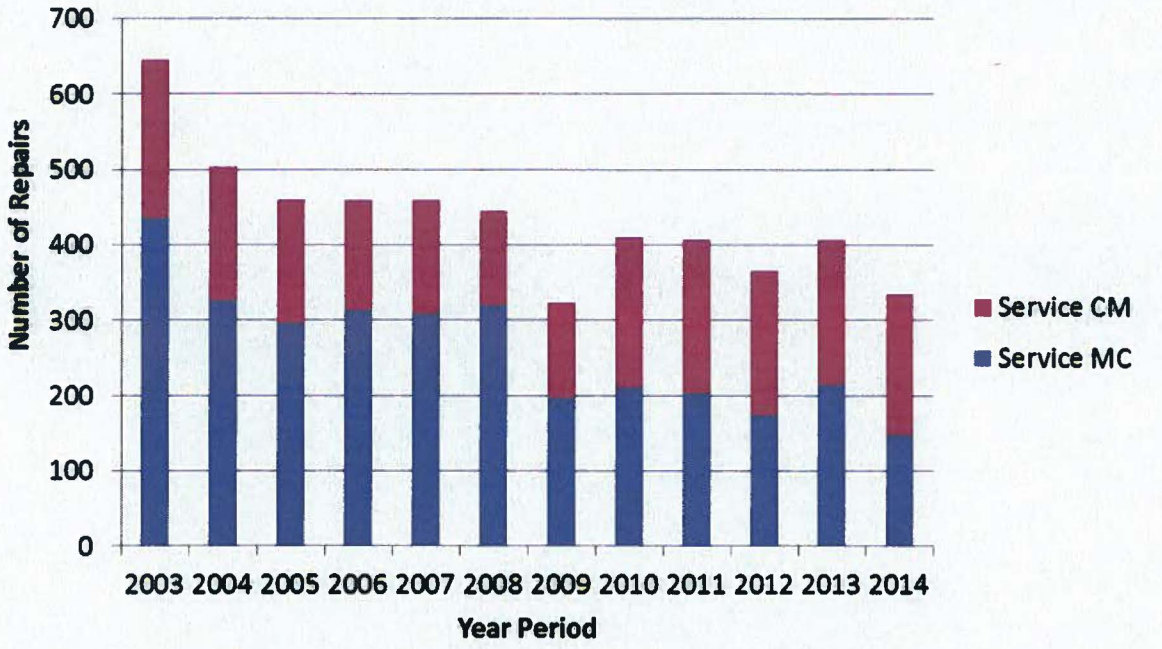
Data Source: EGIS Leak Repairs-Grade-State-Suburb-Collection.xlsx

Note: The relative order of leak rates by material type shown above is in good agreement with Federal EPA Greenhouse Gas Emissions data for methane releases from all U.S. gas distribution service lines.
Reference: http://www.ecfr.gov/cgi-bin/text-idx?SID=265f0267789d99416d22a4085fdbdc9a&node=ap40.21.98_1238.10&rgn=div9

3.4.1 Leak History on Service Lines

Figure 6 through Figure 9 show the 2003 through 2014 repaired service line leak history for the underground portions of the service lines. Leaks are identified separately as M-C (leaks that developed on the underground portion of the service line stretching from the main to the curb box) and C-M (leaks that developed on the underground portion of the service line leading from the curb box toward the meter).

Figure 6. Repaired Leaks on Services



Data Source: EGIS Leak Repairs-Grade-State-Suburb-Collection.xlsx

Figure 6, above, indicates that the number of repaired leaks on both underground sections of the service lines continue to be substantial; together totaling nearly ten times the number of leaks shown for mains in Figure 4. It is also important to note that the only decline in leaks on services shown in the above figure is in the M-C portion of the service lines. On the C-M portion of the service lines, which is closest to buildings and their occupants, leaks remain steady or are slightly increasing.

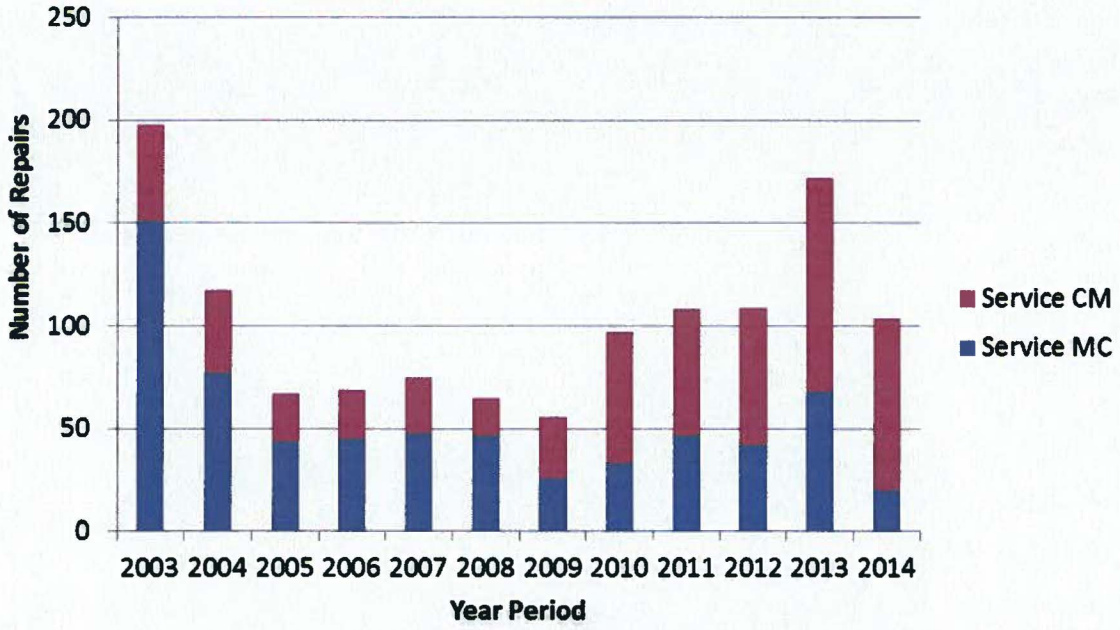
3.4.2 Leak History on Service Lines by Cause

In order to identify specific causes of leaks, Lummus Consultants analyzed detailed service line information contained in Duke Energy Kentucky's Enterprise Geographical Information System (EGIS) data base of all *repaired* Kentucky leaks. It was not possible to analyze leak causes from the annual reports that Duke Energy Kentucky files with the DOT since these do not break out leaks by cause. Lummus Consultants also considers the EGIS leak data to be more applicable for analysis than the DOT information since the DOT information covers *reported* leaks whereas the EGIS information covers *repaired* leaks. Importantly, a leak can be reported by a customer or any person noticing what is thought to be a leak; however, when Duke Energy Kentucky sends a trained employee to check out the reported leak, it may turn out that there really was no leak, and that it was inaccurately reported. Thus the DOT figures for reported leaks may be higher than the number of leaks verified and repaired.

Figure 7 and Figure 8 present leak history for two specific leak causes; corrosion and material & welds, respectively. These two categories of causes of leaks are characteristic of service lines made from metallic materials. The causal category of corrosion applies to all metallic services; the causal category of material & welds applies to all material types but includes materials such as mechanical or compression fittings where threaded and bolted metallic connections can also deteriorate from corrosive ground conditions. Figures 7 and 8 do not provide convincing evidence that leaks from these causes declined following Duke Energy Kentucky's AMRP.

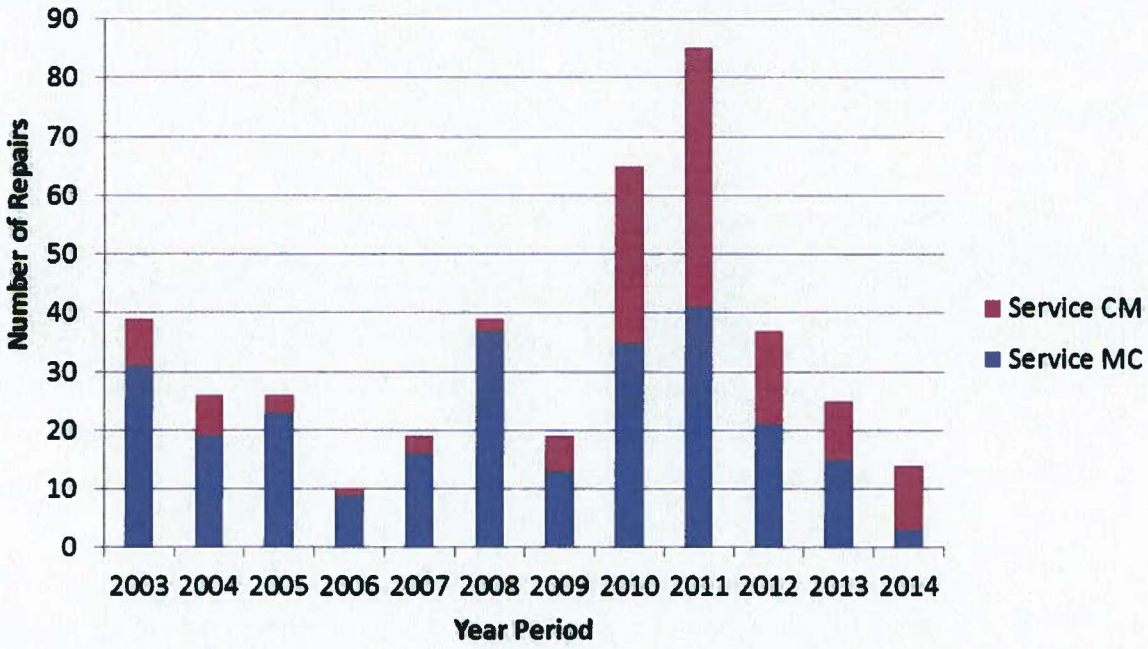
In contrast, Figure 9 presents the total number of service leaks from all other causes except excavation damage (as well as not including leaks from corrosion or leaks from material & welds causes). Figure 9 shows a definite improvement in leaks for non-corrosive causes following the AMRP, which ended in 2010. It also appears that these leaks have stabilized after 2010. It is concluded from these figures that repairs of leaks due to material corrosion contribute to a significant proportion of the total leak repairs.

Figure 7. Repaired Leaks on Services due to Corrosion



Data Source: EGIS Leak Repairs-Grade-State-Suburb-Collection.xlsx

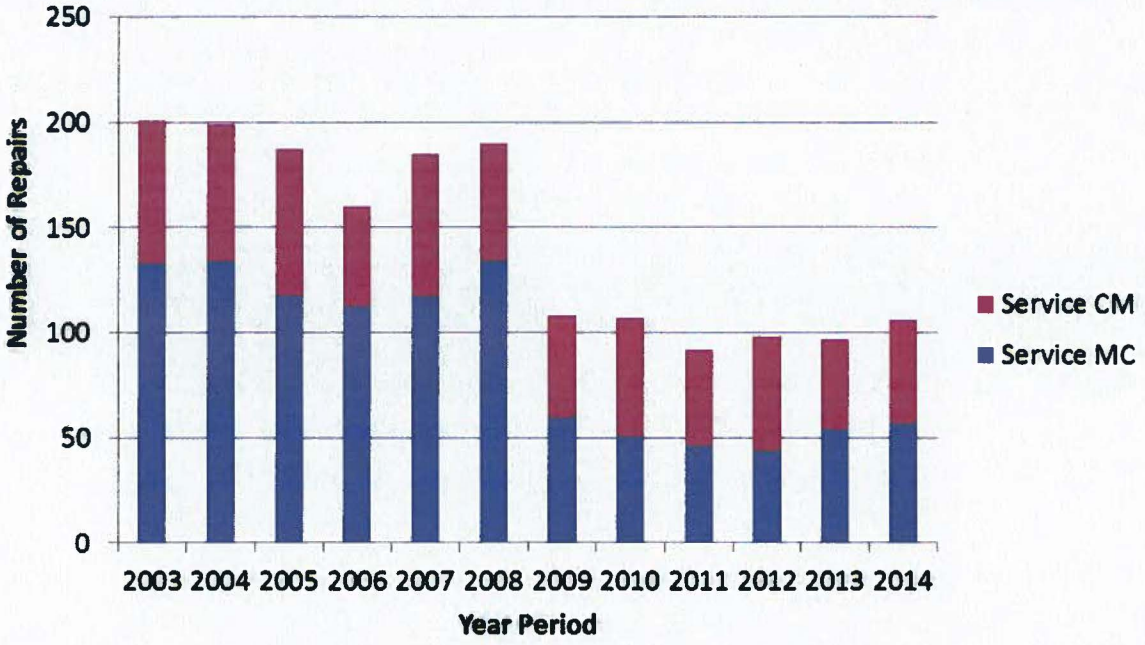
Figure 8. Repaired Leaks on Services due to Material & Welds



Data Source: EGIS Leak Repairs-Grade-State-Suburb-Collection.xlsx

The leak trends shown above in Figures 7 and 8 illustrate non-declining and unstable patterns. Importantly, they also indicate that the number of leaks on the C-M portion of the service is growing in relative proportion. This is significant since the C-M portion of the service line is closer to the building and its occupants.

Figure 9. Repaired Leaks on Services due to All Other Causes (Except Excavation Damage)



Data Source: EGIS Leak Repairs-Grade-State-Suburb-Collection.xlsx

Figure 9, above, shows that following Duke Energy Kentucky's AMRP, the number of leaks from most leak causes (all except corrosion, materials & welds, and excavation) declined and has stabilized. Importantly this figure indicates that the total number of leaks from the causes shown is now in the range of 100 service leaks per year. This compares with the number of corrosion leaks and material & welds leaks shown in Figures 7 and 8 of about 110 to 120 per year, indicating those are now the predominant cause of controllable (non-excavation-caused) service line leaks.

4 Current Service Line Attributes

4.1 Main to Curb vs Curb to Meter

Duke Energy Kentucky maintains records of service lines in their internal data files categorized as either M-C, or C-M. The M-C line extends from the supplying main as far as the property line, where a curb box valve is often located. The C-M service line is the portion extending from the property line, or curb box valve, as the case may be, to the meter. There are at least two reasons for the categorization of service lines. The first reason is historical; Kentucky had traditionally split the ownership of service lines where the gas company owned and maintained the M-C portion, while the homeowner owned and maintained the C-M portion. This designation has been changing with new rules for ownership and maintenance. The gas company will continue to be responsible for the M-C portion and the appropriate C-M portion when the gas company performs maintenance (such as replacement of the service) on the C-M line.

The second reason for keeping track of both portions of the service lines relates to the electrical protection on metallic lines. The curb box valves are not electrically conductive, resulting in a potentially different degree of cathodic protection on the two portions of the service line. The continuity of ownership from main through to the meter is seen as an obvious and prudent arrangement, giving line integrity responsibility to the most capable party, the LDC. As such, the objective of maintaining safety of the service lines is enhanced.

Records supplied by Duke Energy Kentucky indicate that currently there are 96,746 M-C service lines in the data files, and 90,167 C-M service lines.

4.2 Service Line Material Types

4.2.1 M-C Service Line Material Types

Table 1 identifies the number of M-C service line material types that are currently installed in the Duke Energy Kentucky system.

Table 1. Number of M-C Services by Material Type

Number of M-C Services by Material Type	
Bare Steel	90
Cast Iron	1
Coated Copper	2
Coated Steel	2,390
Copper Tubing	36
Copper	7,412
Steel Tubing	-
Steel	96
(Subtotal Metallic)	*10,027*
Plastic	86,030
Unknown	689
Total	**96,746**

Data Source: EGIS file - Services_w_Zip_Codes_Ky.xlsx

As shown in Table 1 above, Duke Energy Kentucky's M-C records of service lines indicate they are predominantly plastic (polyethylene). Slightly over 10,000 service lines in the current system are metallic. Most metallic lines are composed of copper material, with the remainder steel (and one cast iron service line). However, nearly 700 service lines are of unknown material type.

4.2.2 C-M Service Line Material Types

Table 2 identifies the number of C-M service line material types that are currently installed in Duke Energy Kentucky's system.

Table 2. Number of C-M Services by Material Type

Number of C-M Services by Material Type	
Bare Steel	114
Cast Iron	-
Coated Copper	16
Coated Steel	1,199
Copper Tubing	515
Copper	2,748
Steel Tubing	1
Steel	199
(Subtotal Metallic)	*4,792*
Plastic	74,065
Unknown	11,310
Total	**90,167**

Data Source: EGIS file - Services_w_Zip_Codes_Ky.xlsx

As shown above in Table 2, Duke Energy Kentucky's C-M records of service lines indicate they are also predominantly plastic (polyethylene). About 4,800 service lines in the current system are known to be metallic. Most metallic lines are again composed of copper material, with the remainder steel. However; more than 11,000 service lines are of unknown material type.

Duke Energy Kentucky's C-M records are less complete than its M-C records, largely due to the prior homeowner responsibility of maintaining the C-M portion of the lines. For this reason Duke Energy Kentucky uses its more complete M-C records to report annual data to the DOT for its Form 7100.1-1.

4.3 Service Line Age Categories

4.3.1 M-C Service Line Age Categories

Table 3 identifies the number of service lines by installation date for M-C service lines currently installed in Duke Energy Kentucky's system.

Table 3. Number of M-C Services by Age Categories for Year Installed

Number of M-C Services by Age Categories for Year Installed	
pre-1940	311
1940s	194
1950s	924
1960s	5,901
1970s	5,285
1980s	7,772
1990s	26,298
2000s	44,195
2010s	5,064
Unknown	802
Total	**96,746**

Data Source: EGIS file - Services_w_Zip_Codes_Ky.xlsx

Duke Energy Kentucky's age records for existing service lines are shown above in Table 3. These records indicate that some of Duke Energy Kentucky's service lines were installed as far back as 1940 or even earlier. These lines would currently be in the range of 70 to 80 years old. Additionally Duke Energy Kentucky has no record of the age of about 800 service lines.

4.3.2 C-M Service Line Age Categories

Table 4 identifies the number of service lines by installation date for C-M service lines currently installed in Duke Energy Kentucky's system.

Table 4. Number of C-M Services by Age Categories for Year Installed

Number of C-M Services by Age Categories for Year Installed	
pre-1940	482
1940s	4
1950s	6
1960s	633
1970s	298
1980s	5,834
1990s	21,485
2000s	37,722
2010s	6,007
Unknown	17,696
Total	**90,167**

Data Source: EGIS file - Services_w_Zip_Codes_Ky.xlsx

As in the M-C records (Table 3) some service lines date back prior to 1940. However, as shown in Table 4, the much larger unknown age record of C-M services presents a significant reliability gap, as compared to the M-C services records. The large number of unknown age service lines indicates that Duke Energy Kentucky has not yet taken over responsibility for these lines from the homeowner.

4.4 Service Line Pressure Categories

4.4.1 M-C Service Line Pressure Categories

Table 5 identifies the number of service lines at each allowable limits of operating pressure for M-C service lines currently installed in Duke Energy Kentucky's system.

Table 5. Number of M-C Services by Allowable Limits of Operation Pressure

Number of M-C Services by Allowable Limits of Operating Pressure	
SP (7" - 10" W.C.)	14,218
MP (1 - 5 psig)	-
IP (5 - 35 psig)	46,839
HP (15 - 60 psig)	34,338
Feeder (60+ psig)	1,057
Transmission	289
Unknown	5
Total	**96,746**

Data Source: EGIS file - Services_w_Zip_Codes_Ky.xlsx