DUKE ENERGY OHIO EXHIBIT ___

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc., for Approval of an Alternative Rate Plan Pursuant to Section 4929.05, Revised Code, for an Accelerated Service Line Replacement Program.	))))))	Case No. 14-1622-GA-ALT

DIRECT TESTIMONY OF

JOHN A. HILL, JR.

ON BEHALF OF

DUKE ENERGY OHIO, INC.

October 23, 2015

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ATTACHMENT

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John A. Hill, Jr., and my business address is 139 East Fourth Street, Cincinnati, Ohio 45202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by the Duke Energy Business Services LLC (DEBS) as Director, Gas Engineering, for Duke Energy Ohio, Inc., (Duke Energy Ohio or Company) and Duke Energy Kentucky, Inc. (Duke Energy Kentucky). DEBS provides various administrative and other services to Duke Energy Ohio and other affiliated companies of Duke Energy Corporation (Duke Energy).

Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from the University of Cincinnati with a Bachelor of Science in Civil & Environmental Engineering and later obtained an MBA from the University of Kentucky. In 1996, I obtained my license as a Professional Engineer in the Commonwealth of Kentucky and, by reciprocity, later in the state of Ohio.

I started my career as an engineering consultant focused mainly on completing geotechnical and environmental projects for various companies and public agencies. I then worked for an investor-owned water utility, overseeing new development and pipeline extension projects, as well as asset mapping/records.

I joined Cinergy Corp. in 2001 and held various management/leadership positions in Generation and Environmental, Health & Safety, and, in 2010, joined the Gas Engineering Department as Director of Engineering.

Q. PLEASE SUMMARIZE YOUR RESPONSIBILITIES AS DIRECTOR, GAS ENGINEERING.

A. As Director, Gas Engineering, I oversee multiple engineering disciplines (Civil, Mechanical, Electrical/Controls, and Corrosion) and technical functions responsible for gas pipeline activities such as design, system monitoring, system design, meter/regulator design, integrity management, and corrosion services. I also provide planning and oversight for the Gas Operations capital budget. In addition, I represent Gas Operations on corporate and industry initiatives/committees. Importantly, I provide subject matter expertise for Duke Energy Ohio's and Duke Energy Kentucky's integrity management programs.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC UTILITIES COMMISSION OF OHIO?

A. No, I have not.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to discuss Duke Energy Ohio's natural gas distribution integrity management program (DIMP) and the federal and state regulations that drive the Company's mission to provide safe, reliable, and affordable natural gas distribution service to its customers. I will also provide an overview of Duke Energy Ohio's annual capital expenditures for current gas

system integrity, safety, and reliability projects and how the associated capital expenditures are categorized and prioritized. I will then discuss why Duke Energy Ohio's proposed Accelerated Service Line Replacement Program (ASRP) is necessary to fulfill the Company's mission and to comply with state and federal regulations.

II. DISTRIBUTION INTEGRITY MANAGEMENT PROGRAMS

Q. PLEASE EXPLAIN WHO REGULATES DISTRIBUTION INTEGRITY MANAGEMENT FOR NATURAL GAS UTILITIES.

A. The Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates natural gas utilities' distribution integrity management programs.

Q. PLEASE IDENTIFY THE REGULATIONS THAT DRIVE DUKE ENERGY OHIO'S DISTRIBUTION INTEGRITY MANAGEMENT INITIATIVES.

A. Requirements governing Duke Energy Ohio's DIMP are part of the Pipeline Safety Regulations, CFR Part 192, Subpart P – Gas Distribution Pipeline Integrity Management. These rules define the required "Integrity Management Program" as "an overall approach by an operator to ensure the integrity of its gas distribution system."

Q. WHY IS DISTRIBUTION INTEGRITY MANAGEMENT IMPORTANT?

A. As stated previously, distribution integrity management is an overall approach to ensure the integrity (*i.e.*, safety) of the gas distribution system. These regulations impose upon the Company an obligation to continuously evaluate the risks

associated with its distribution system and to maintain and improve its safety and performance.

Q. PLEASE DESCRIBE DUKE ENERGY OHIO'S CURRENT DIMP.

A. Duke Energy Ohio's DIMP is summarized in a written document that meets all the requirements of CFR 192 Subpart P – Gas Distribution Pipeline Integrity Management and follows the following seven elements outlined in the regulation:

1) Knowledge of the gas distribution system;
2) Identify threats;
3) Evaluate and rank risk;
4) Identify and implement measures to address risks;
5) Measure performance, monitor results, and evaluate effectiveness;
6) Periodic evaluation and improvement; and
7) Report results.

These elements support the basis of the DIMP and provide direction in evaluating initiatives to reduce risks in the distribution system.

Q. PLEASE EXPLAIN HOW DUKE ENERGY OHIO IDENTIFIES, DESIGNS, PRIORITIZES, AND IMPLEMENTS PROJECTS BASED ON ITS DIMP.

A. Duke Energy Ohio identifies, evaluates, and ranks risks in its distribution system and prioritizes measures to address these risks based on a relative risk model that takes into consideration threats to the system, as defined in CFR 192.1007, which threats include corrosion, natural forces, excavation damage, material, weld or joint failure, incorrect operation, and other concerns that would threaten the

integrity of the pipeline. The method used to determine the risk in Duke Energy Ohio's distribution system is based on the relative risk associated with repaired leaks. This risk is then aggregated for the entire system. The model is configured to utilize consequence values and a probability of one, for each individual leak repair. Risk is calculated for each repair, along with the inclusion of facility and location data. Individual leak risk is then summed up to develop risk scores at a system level. Threats with the highest total risk scores are then reviewed to determine appropriate measures to reduce and/or eliminate the risk.

Attachment JAH-1 is a summary of how the relative risk is developed under the DIMP.

Q. HAS DUKE ENERGY OHIO IMPLEMENTED ANY OTHER PROGRAMS DESIGNED TO IMPROVE SAFETY AND RELIABILITY?

A. Yes.

Q. PLEASE DESCRIBE THE COMPANY'S OTHER PROGRAMS THAT ADDRESS DISTRIBUTION SYSTEM RELIABILITY.

A. Duke Energy Ohio has implemented several programs over time to improve the safety and reliability of its distribution system. The most noteworthy of these programs is its Accelerated Main Replacement Program (AMRP). Construction under the AMRP began in 2001, when Duke Energy Ohio, with the approval of the Public Utilities Commission of Ohio (Commission), implemented replacement program for certain of its gas mains that were considered high risk for leak or failure (cast iron and bare steel). The AMRP initiative also included certain leak-prone service lines that were attached to the gas mains targeted for replacement.

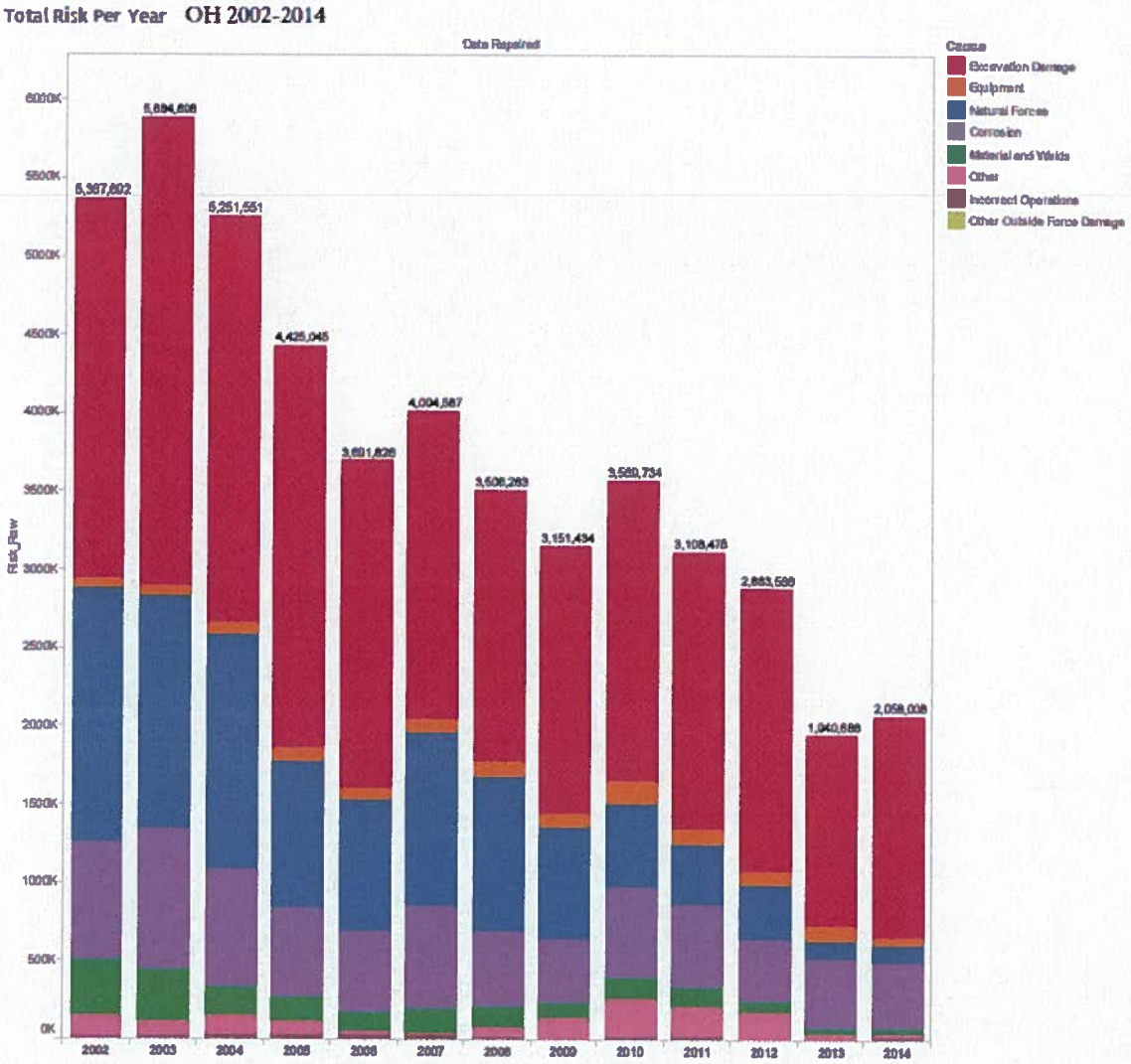
The AMRP, however, did not include replacement of all leak-prone service lines. Only those service lines that were directly attached to mains targeted for replacement under the AMRP were replaced as part of this program. Other leak-prone services that developed leaks were replaced individually, in the normal course of business.

The Company also implemented a riser replacement program to replace service head adapters that had a high likelihood of leakage. Additionally, the Company has several other initiatives to enhance the safety of its delivery system, as well as public education campaigns to increase customer awareness of natural gas safety and, as discussed in more detail later in my testimony, underground damage prevention.

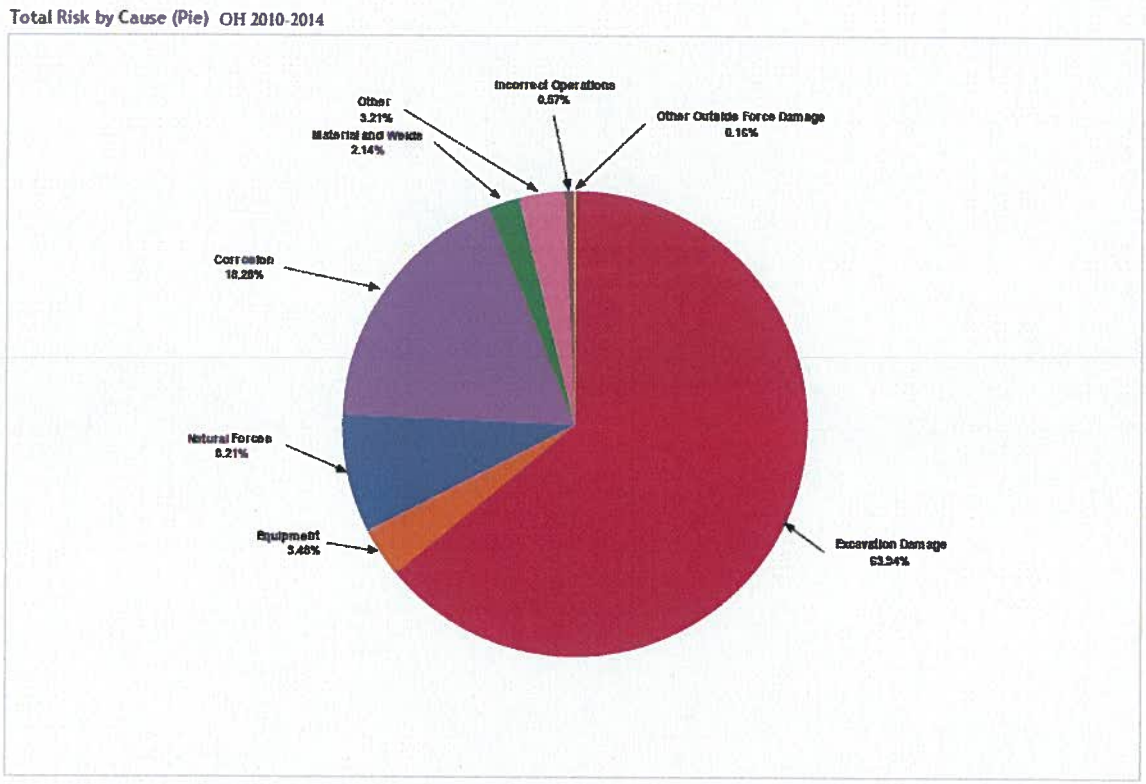
Q. PLEASE QUANTIFY THE IMPACT THAT DUKE ENERGY OHIO'S DISTRIBUTION INTEGRITY MANAGEMENT PROGRAMS, INCLUDING ITS AMRP INITIATIVE, HAVE HAD UPON THE COMPANY'S SAFETY AND RELIABILITY.

A. Duke Energy Ohio's various programs have yielded benefits in terms of safety and reliability. However, they have not – and cannot – eliminate all risks to the system. The Company is completing the AMRP by the end of 2015, on time and on budget. As expected, as a direct result of the AMRP, Duke Energy Ohio has experienced a decrease in the number of leaks on its gas mains. However, the Company did not see a similar decrease in the number of leaks in the curb-to-meter distribution service lines.

As described previously, the risk model for DIMP provides a relative basis to compare risks in the distribution system. These system risks over time are quantified in the following table:



Although the total risk score for the Duke Energy Ohio system has dropped significantly since 2002, mainly due to the reduction of leaks associated with cast iron and bare steel mains replaced as part of AMRP, the continued leaks related to corrosion (mainly copper services) place corrosion as the second highest threat, behind excavation damage, as shown in the following table:



The need to address this issue from a safety, reliability, and overall integrity management perspective is the driver of the Company's application in this proceeding.

Q. ARE THERE RISKS ASSOCIATED WITH A SERVICE LINE LEAK?

A. Yes. Any time there is a natural gas leak, there is a potential hazardous condition. Service lines operate at the same pressure as gas mains and are generally located closer in proximity to customers' premises. Although actual incidents of catastrophic failures attributed to service lines may be fewer than those associated with natural gas mains, there is still a possibility of damage and risk to life and property in the event of a catastrophic failure. In my opinion, just because statistics may show that, on a national level, the number of catastrophic events attributed to service line failures is less the number of such events on gas mains,

one should not diminish or disregard the prudency of taking action to eliminate or mitigate these risks. Duke Energy Ohio values its customers and its goal is to take all necessary steps to provide safe, natural gas service in all facets of its operations.

III. DUKE ENERGY OHIO'S CAPITAL BUDGETING AND EXPENDITURES

Q. HOW DOES THE GAS OPERATIONS GROUP DETERMINE WHAT CAPITAL EXPENDITURES WILL BE MADE IN ANY GIVEN YEAR?

A. Duke Energy Ohio prepares a range of budget forecasts as part of the overall capital planning process. The projects are prioritized by year based on input from sources across Gas Operations, including Project Sponsors, Field & System Operations, and Integrity Management. The capital planning process is updated annually and approved by executive management.

Q. ONCE DUKE ENERGY OHIO HAS DECIDED ON A BUDGET FOR CAPITAL EXPENDITURES, HOW ARE THOSE EXPENDITURES CATEGORIZED?

A. The capital budget is generally categorized into four main groups: 1) expansion, 2) maintenance, 3) recoverables, and 4) major projects. The general definitions are as follows:

1) Expansion: This category generally includes projects that are not included in 'Recoverable.' It includes projects adding gas throughput, revenue-producing projects, and acquisitions.

2) Maintenance: This category includes all capital projects that do not fit within the other three categories.

3) Recoverables: This category is defined as items that are recovered outside of normal base rates and that (a) have a specific clause/rider/tracker or (b) are deemed probable for future regulatory treatment that would result in a clause/rider/tracker.

4) Investment (Major Projects): This category includes large projects (greater than $25 Million) that are garnering AFUDC and that are not within the Recoverable or Expansion categories.

Q. EXPLAIN HOW THE COMPANY PLANS AND PRIORITIZES ITS CAPITAL PROJECTS.

A. Projects are prioritized based upon the Company's risk assessment and in consideration of the category or nature of projects such as safety and system integrity, customer request, and general maintenance.

Q. PLEASE SUMMARIZE THE COMPANY'S RECENT ANNUAL BUDGETS FOR CAPITAL PROJECTS.

A. The Company's recent budgets for capital projects are summarized in the following table:

Ohio Capital			
	Actual	**Budget**	**Variance**
Recoverable	62,851,037.00	54,206,338.00	(8,644,699.00)
Expansion	5,017,465.80	12,979,829.00	7,962,363.20
Maintenance	32,256,801.20	33,979,219.00	1,722,417.80
Investment			-
2011 Total	**100,125,304.00**	**101,165,386.00**	**1,040,082.00**
	Actual	**Budget**	**Variance**
Recoverable	74,707,804.00	54,123,117.00	(20,584,687.00)
Expansion	8,116,221.40	7,919,936.00	(196,285.40)
Maintenance	34,179,781.60	33,110,585.00	(1,069,196.60)
Investment			-
2012 Total	**117,003,807.00**	**95,153,638.00**	**(21,850,169.00)**
	Actual	**Budget**	**Variance**
Recoverable	69,968,347.56	52,663,482.43	(17,304,865.13)
Expansion	7,447,939.26	8,665,550.39	1,217,611.13
Maintenance	22,468,903.86	27,185,178.55	4,716,274.69
Investment	-	-	-
2013 Total	**99,885,190.68**	**88,514,211.37**	**(11,370,979.31)**
	Actual	**Budget**	**Variance**
Recoverable	60,527,081.86	68,510,902.29	7,983,820.43
Expansion	7,991,213.10	7,622,916.11	(368,296.99)
Maintenance	29,574,327.59	44,918,363.10	15,344,035.51
Investment	-	-	-
2014 Total	**98,092,622.55**	**121,052,181.50**	**22,959,558.95**
	Actual	**Budget**	**Variance**
Recoverable	34,970,005.00	37,091,600.75	2,121,595.75
Expansion	7,764,789.00	7,006,502.20	(758,286.80)
Maintenance	28,475,999.00	40,730,662.00	12,254,663.00
Investment	130,482.00	-	(130,482.00)
September 2015 YTD	**71,341,275.00**	**84,828,764.95**	**13,487,489.95**

Q. HAVE DUKE ENERGY OHIO'S ACTUAL CAPITAL EXPENDITURES BEEN CONSISTENT WITH THE COMPANY'S BUDGETS?

A. Yes.

Q. PLEASE EXPLAIN.

A. Duke Energy Ohio's budgeted versus actual expenditures over the time period shown is within 1 percent.

IV. THE PROPOSED ASRP

Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE COMPANY'S ASRP PROPOSAL.

A. Based upon the risks I previously discussed and in recognition of federal integrity management requirements for natural gas distribution systems, most notably rules promulgated by PHMSA, Duke Energy Ohio is proposing to implement a ten-year ASRP initiative to immediately and expeditiously address a safety risk identified in the DIMP. As discussed previously, the second highest relative risk is associated with corrosion leaks, with a majority occurring on service lines. The Company proposes to address this risk through a targeted and deliberate replacement of these at-risk facilities, for the benefit of all customers and the public.

Q. IF CORROSION LEAKS COMPRISE THE SECOND HIGHEST RELATIVE RISK IDENTIFIED IN THE DIMP, WHAT IS THE HIGHEST RELATIVE RISK?

A. The highest relative risk to the Company's gas delivery system that is identified through the DIMP is damage done to the gas delivery system by third-party excavations.

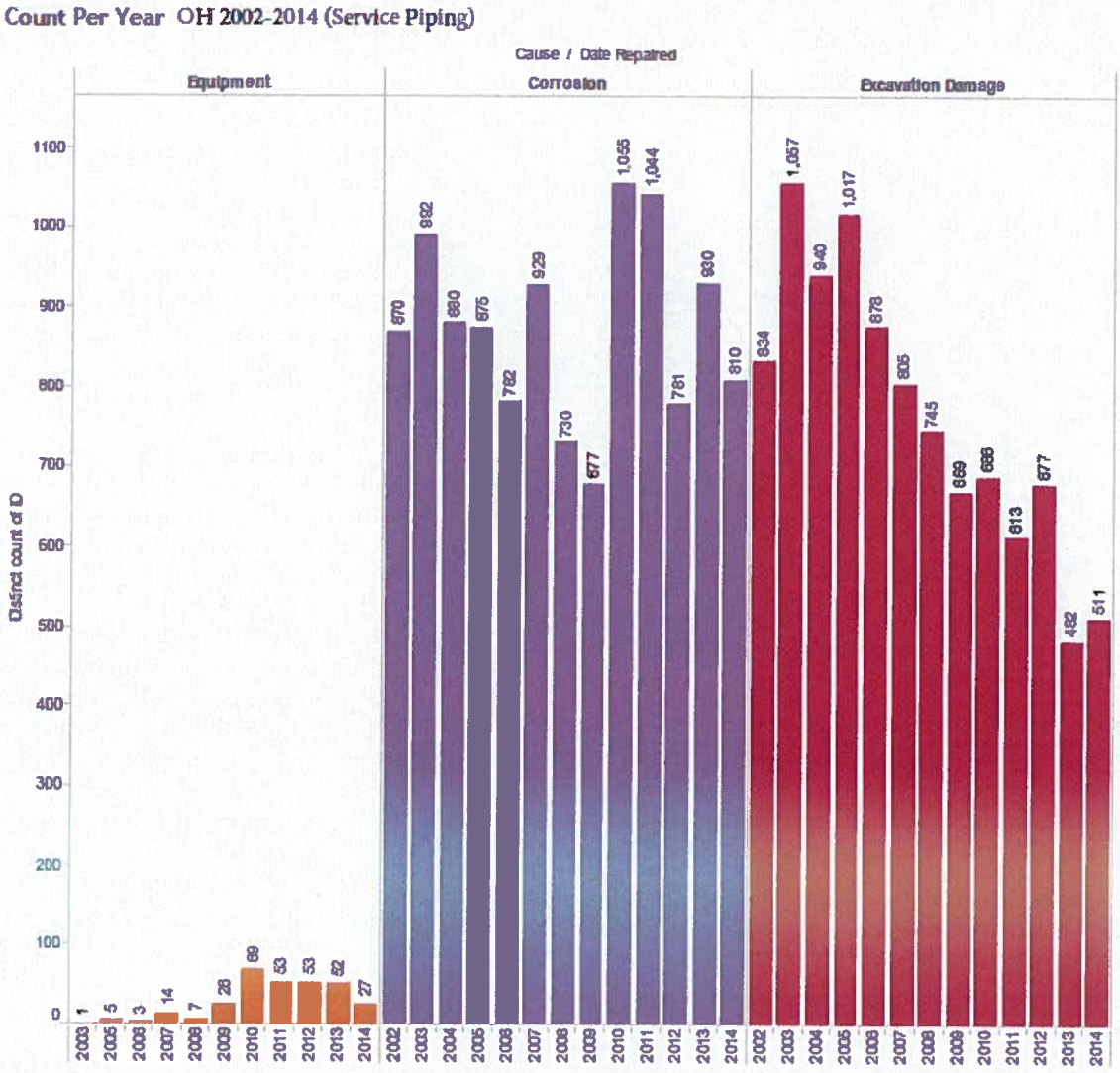
Q. IS THE COMPANY CURRENTLY ADDRESSING THAT RISK, AS COMMISSION STAFF RECOMMENDED?

A. Duke Energy Ohio has, in fact, already taken steps to proactively address this risk and appreciates the attention the Commission has given this issue through public service announcements and other outreach efforts over the years. For each excavation incident, Duke Energy Ohio has an investigator who arrives at the incident site to determine fault and provide education on how to prevent reoccurrence. The Company has increased its public awareness program outreach to include education on excavation laws and regulations such as "Call Before You Dig." Duke Energy Ohio also reaches out to individual contractors and provides specific education related to excavations near gas facilities. Duke Energy Ohio meets monthly with its locating company and contractors to discuss their at-fault damages and to identify issues to avoid repeat occurrences. Duke Energy Ohio responds to untoneable services/mains to work toward making them toneable and has an inspector on site when an excavator is digging within 25 feet of a "High Pressure" (>60 psig) pipeline. The Company also promotes April as National Safe Digging Month through community outreach initiatives and communications. For example, the Company has recently displayed a message at the Cincinnati Convention Center, reminding people of the importance of safe digging. The Company participates in excavator seminars and emergency responder seminars throughout the year to provide education on natural gas mains and services and safe work practices.

Duke Energy Ohio has also been an active participant in the Ohio Underground Damage Prevention Coalition. The Coalition assisted in the recent legislative reforms of Ohio law with regard to the technical requirements

concerning protection of pipelines from third-party damage and enforcement of those requirements, through Sub. H.B. 458, 129th General Assembly, and Am. Sub. S.B.378, 130th General Assembly.

These efforts have been fruitful, as the number of incidents or leaks due to a third-party excavation has declined over the last few years. This decrease can be seen in the following graph, which depicts the events per year on main-to-curb and curb-to-meter service piping in each category:



Although the incidents due to third-party excavation are declining, the leaks related to corrosion continue. These metallic pipe materials will continue to corrode over time, unless replaced.

Q. PLEASE EXPLAIN THE NEED FOR THE ASRP FROM A SAFETY AND RELIABILITY PERSPECTIVE.

A. The ASRP is the proposed measure to address the risks to the natural gas delivery system identified in the Company's DIMP. As required in the regulations, once a risk is identified, the Company must respond to and address that risk. The ASRP is the Company's proposal to address the risk to the delivery system created by these leak-prone services. Replacing these services in an accelerated and targeted manner will reduce the number of incidents by eliminating the root cause of the leaks and will reduce the exposure to increased failures as these services continue to age. An accelerated approach allows the Company to manage costs to enable completion of the work over the next few years, rather than decades or more, and in an efficient manner by targeting an entire area at once, as opposed to a more expensive reactive approach.

Q. IS THE ASRP ACTUALLY REQUIRED BY PHMSA OR UNDER ITS DIMP REGULATIONS?

A. PHMSA does not mandate any specific remedial actions. PHMSA is the federal agency that, among other things, oversees the transportation of natural gas through pipelines. In carrying out this function, PHMSA establishes national policy, sets and enforces standards, educates, and conducts research to prevent incidents. The DIMP procedural regulation is the tool used by PHMSA to require

utilities to develop, maintain, and follow an integrity management program to enhance the safety and integrity of their gas delivery systems. The DIMP regulation essentially requires utilities to continually evaluate their delivery systems for risks and to develop immediate strategies to address those identified risks. The evaluation is to be performed in accordance with the seven factors I previously discussed. So, while neither the federal DIMP regulation nor PHMSA requires any specific type of action or replacement activity, nonetheless, under the regulation, once a utility identifies a risk using the mandatory evaluation approach, or "elements," it must then manage its system appropriately. The appropriate system management requires the utility to address and correct the identified risk(s). Therefore, now that the Company has identified the risks associated with these service lines, the Company must address these risks, as required under the federal DIMP regulation. The methodical replacement of these leak-prone services under the ASRP is the safest, most efficient, and most cost-effective way to respond to these identified risks and to protect customers.

Q. IN YOUR OPINION, DOES REPLACING THESE AT-RISK SERVICE LINES UNDER THE CURRENT TIME LINE ADEQUATELY RESPOND TO THE IDENTIFIED RISKS, UNDER THE FEDERAL DIMP REGULATIONS?

A. No. These services are already identified as a system risk, as the leaks from corrosion on these lines are increasing. Under DIMP rules, the Company must now take action. Without a widespread program for replacement, the identified pattern of service line leaks will only increase as time goes on and these systems

continue to age, constantly being exposed to corrosive forces. We had previously developed a replacement program, addressing approximately 200 per year, but circumstances continue to change. As we have continued our evaluation of the situation, we have determined that this risk is growing and that the current replacement rate would mean that it would take more than 100 years for the Company to replace all of these services. Customers should want their utility to be proactive to address potential weaknesses on its system before a hazardous situation develops. We believe that an accelerated approach is appropriate at this time.

Q. PLEASE EXPLAIN HOW THE ASRP IS CONSISTENT WITH INDUSTRY INITIATIVES AND BEST PRACTICES.

A. The 2012 report by the American Gas Foundation entitled "Gas Distribution Infrastructure: Pipeline Replacements and Upgrades" describes then United States Secretary of Transportation Ray LaHood's "Pipeline Safety Action Plan" calling for pipeline operators, including local natural gas distribution companies, to accelerate their efforts to replace pipeline facilities and take other actions that would enhance the integrity of network facilities This ASRP aligns with Secretary LaHood's "Call to Action" for the industry, as well as similar programs undertaken by other natural gas local distribution companies.

Q. IS THERE ANY QUANTATIVE ANALYSIS THAT SUPPORTS THE NEED FOR THE COMPANY'S ASRP INITIATIVE?

A. Yes. Duke Energy Ohio performed a detailed review of its own operation and maintenance practices, including the leak rates for the different types of service

materials. Duke Energy Ohio has also retained Lummus Consultants (Lummus) to independently analyze the leak history on the Company's service lines and to determine whether conditions exist warranting the implementation of an accelerated service replacement program. As explained in the Direct Testimony of Edward A. McGee, Duke Energy Ohio has seen an increase in the number of leaks along its natural gas delivery system, associated with service lines. This increase in service leaks, as well as the decrease in main leaks attributable to the successful implementation of the AMRP, is highlighted in successive DIMP risk assessment results. In other words, service leak rates are increasing and must be addressed.

The Lummus Study (comprising both the initial Accelerated Service Replacement Program and the Supplement to the March 10, 2014 Accelerated Service Replacement Program Report) shows that the number of leaks caused by factors such as corrosion or materials and welds were not declining as expected due to progress made during the AMRP. The Company is now seeing an increase in the number of leaks in its distribution system, located within the main-to-curb and curb-to-meter service lines.

Q. PLEASE EXPLAIN HOW THE ASRP IS BOTH CONSISTENT AND IN COMPLIANCE WITH THE REGULATIONS YOU PREVIOUSLY DISCUSSED.

A. As stated earlier, the Company's DIMP is consistent with CFR 192 Subpart P – Gas Distribution Pipeline Integrity Management, which defines the required Integrity Management Program as "an overall approach by an operator to ensure

the integrity of its gas distribution system." Leak rates on non-protected metallic services have been identified as a risk in the Company's distribution system and the ASRP is the proposed measure to address this risk, as required in the regulations.

Q. WHAT IS THE ESTIMATED COST OF CONSTRUCTION UNDER THE ASRP, PER YEAR AND IN TOTAL?

A. The current estimated cost of construction is approximately $320 million, broken down as follows: $5 million in 2015, $31 million in 2016, $33 million in 2017, $34 million in 2018, $36 million in 2019, $37 million in 2020, $38 million in 2021, $38 million in 2022, $40 million in 2023, and $28 million in 2024.

Q. WHAT IS THE ESTIMATED COST OF OPERATION OF THE NEW SERVICES, ONCE THE PROGRAM IS COMPLETED?

A. In terms of Operations and Maintenance expense, there are no incremental operating costs associated with ASRP once the program is completed. Once installed, these new service lines will constitute new plant in service and eventually will be rolled into base rates at the time of the Company's next base natural gas rate case.

Q. HOW WERE THESE ESTIMATES DERIVED?

A. Duke Energy Ohio has estimated that approximately 58,000 service lines will need to be replaced during the ten-year ASRP. The cost per service replacement is approximately $4,500 in 2015 and, with 3 percent inflation, the main-to-meter installation cost is about $300 million over the ten-year program. In addition, as outlined in the Application, Duke Energy Ohio has also proposed, where

applicable, to move inside meters to the exterior of the customer's premises and also to complete records reconnaissance on an additional 28,000 services. This brings the total cost to approximately $320 million. The number of services to be addressed is based upon Company records and is also depicted in the Lummus Study. Estimated costs for replacing services are based upon current actual costs for similar replacements completed as part of AMRP in Ohio or otherwise.

Q. HOW DOES THE COMPANY PROPOSE TO MANAGE THE COSTS OF THE PROGRAM?

A. Work will be performed by both internal and external resources. The external work will be competitively bid in packages (by communities) to pre-qualified contractors. The bids will be reviewed against historical costs and other factors by Duke Energy Ohio's sourcing department, the Project Manager, and the Manager of Contractor Construction, with a final approval from me as the Director of Engineering. The costs will then be tracked on a monthly basis to ensure actual expenditures are in line with budgets.

V. CONCLUSION

Q. DO YOU HAVE AN OPINION AS TO WHETHER THE ASRP IS REASONABLE AND NECESSARY, FROM A DISTRIBUTION INTEGRITY MANAGEMENT STANDPOINT?

A. Yes, as stated previously, the federal DIMP regulations require natural gas operators such as Duke Energy Ohio to implement the seven required program elements, which include, among other tasks, evaluating and ranking risks and then implementing measures to address those risks. The ASRP will significantly

reduce the risk of corrosion leaks, which risk has been identified in the DIMP as the second highest relative risk based on a three-year (2012-2014) review of leak data.

Q. IS ATTACHMENT JAH-1 TRUE AND ACCURATE TO THE BEST OF YOUR KNOWLEDGE?

A. Yes.

Q. WAS ATTACHMENT JAH-1 PREPARED BY YOU OR UNDER YOUR DIRECTION AND CONTROL?

A. Yes.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

APPENDIX A – RISK MODEL CONFIGURATION

Risk Model

A. The method used to determine the risk in Duke Energy's distribution system is based on the relative risk associated with repaired leaks. This risk is then aggregated for the entire system. The model is configured to utilize the consequence values detailed below and a probability of one for each individual leak repair. Risk is calculated for each repair along with the inclusion of facility and location data. As an example: if a leak occurred on an intermediate pressure main that was a grade 1 leak, then the risk associated with the pressure would be 40 and the grade would be 10. Individual leak risk is then summed up to develop risk scores at a system level.

B. The total risk associated with a specific leak is calculated using the equation below. The weight factors in the risk model are assigned by SME's to give the more hazardous items greater influence on the final score.

C. Risk Formula

Duke Energy risk model is based on the following risk formula:

$$R_T = 1 + \sum_{i=0}^{n} (R_{(i)})$$

$R_{(i)} = P_{(i)} * C_{(i)}$ where,

R_T = Risk score per threat
$R_{(i)}$ = Risk score per event
n = Number of events per threat for the reporting year
$P_{(i)}$ = Probability of the event
$C_{(i)}$ = Consequence of the event

```
Risk_Raw=([C_EventMetric])*([P_Material])*((([C_Pressure]+[C_Grade]+[C_Diameter]) * [C_Proximity] ) *[C_InjuryFatalityRatio])/ 1000
```

D. Weight Factors for Threat Probability

The Pipeline Integrity DIMP database contains the count and cause of events experienced by Duke Energy. The weight factors assigned to each cause are determined by SME's based on the likelihood of the cause to result in a serious incident (injury or fatality) per national averages as provided by the Pipeline Hazardous Materials Safety Administration (PHMSA). Additionally, a second probability factor has been established based on material type with values assigned by SME's based upon operating experience. These relative weights were assigned based on the potential for a material to play a significant role in the occurrence of an event.

```
WHEN [Cause] = 'Excavation Damage' THEN 70
WHEN [Cause] = 'Other' THEN 60
WHEN [Cause] = 'Other Outside Force Damage' THEN 20
WHEN [Cause] = 'Natural Forces' THEN 20
WHEN [Cause] = 'Incorrect Operations' THEN 30
WHEN [Cause] = 'Material and Welds' THEN 20
```

```
WHEN [Cause] = 'Equipment' THEN 20
WHEN [Cause] = 'Corrosion' THEN 20
WHEN [Cause] = 'Company or Agent Excavation' THEN 70
ELSE 70 END)

WHEN [Material] = 'Bare Steel' THEN 70
WHEN [Material] = 'Cast Iron' THEN 90
WHEN [Material] = 'Coated Steel' THEN 15
WHEN [Material] = 'Copper' THEN 40
WHEN [Material] = 'Copper Tubing' THEN 40
WHEN [Material] = 'Ductile Iron' THEN 70
WHEN [Material] = 'Plastic' THEN 20
WHEN [Material] = 'Steel' THEN 70
WHEN [Material] = 'Steel Tubing' THEN 15
WHEN [Material] = 'Unknown' THEN 90
ELSE 90 END)
```

E. Weight Factors for Consequence

The factors selected to represent the relative consequence of an event are based on Duke Energy and Industry experience. The master dataset generated in System Knowledge includes a number of attributes associated with each hazardous and non-hazardous leak. Selected attributes have been utilized to derive the consequence associated with the threat determined to be the root cause. The following attributes and incident results were utilized in the determination of consequence.

F. **Fatality/Injury ($F_{I/F}$):** Fatalities and injury data provide a relative representation as to the potential consequence associated with the various cause. National data as provided by PHMSA will be utilized as a means of weighting the potential consequence associated with each cause.

```
WHEN [Cause] = 'Other' THEN 0.25
WHEN [Cause] = 'Other Outside Force Damage' THEN 0.28
WHEN [Cause] = 'Excavation Damage' THEN 0.22
WHEN [Cause] = 'Material and Welds' THEN 0.09
WHEN [Cause] = 'Natural Forces' THEN 0.23
WHEN [Cause] = 'Corrosion' THEN 0.15
WHEN [Cause] = 'Equipment' THEN 0.09
WHEN [Cause] = 'Incorrect Operations' THEN 0.06
WHEN [Cause] = 'Company or Agent Excavation' THEN 0.22
ELSE 0.35 END)
```

G. **Code Factor (F_c):** This factor is used to consider the leak grade in terms of the higher grade leaks releasing more gas to the environment. Grade 1 leaks with pipe wall breaks will be given the highest weight value.

```
WHEN [Class] = 'Grade 1' AND [Pipe Wall Break?]= 'Yes' THEN 75
WHEN [Class] = 'Grade 1' THEN 25
```

```
WHEN  [Class] = 'Grade 2' THEN  10
ELSE 75 END)
```

H. **Proximity Factor (F_{PR}):** This factor is used to consider the proximity of the gas facility to structures where migration from a leak could result in the collection of gas in an enclosed space at explosive concentrations. Mains were considered to be the highest risk due to potential migration under paving and into sewers, service main to curbs were considered to have some of this risk as well. A meter and regulator set, although located in closer proximity to structures than a service, was assigned a lower weight factor as they are generally located above ground which allows any leaks to immediately vent to atmosphere.

```
WHEN [Tier 1 Facility] = 'MAIN' THEN  75
WHEN  [Tier 1 Facility] = 'SERVICE CM' THEN  50
WHEN  [Tier 1 Facility] = 'SERVICE MC' THEN  60
WHEN  [Tier 1 Facility] = 'AGF' THEN  5
WHEN  [Tier 1 Facility] = 'Other' THEN  75
ELSE 75 END)
```

I. **Pressure Factor (F_p):** This factor is considered as having a direct effect on the consequences associated with any threat based on the operating pressure.

```
WHEN [Pressure] ='Feeder' THEN 60
WHEN [Pressure] = 'HP' THEN 40
WHEN [Pressure] = 'MP' THEN 20
WHEN [Pressure] = 'SP' THEN 5
WHEN [Pressure] = 'IP' THEN 40
ELSE 60 END)
```

J. **Diameter Factor (FD):** The factor is used to consider the pipe diameter in terms of the larger diameters releasing a larger volume of gas to the environment. The weight factors will be scaled by diameter from smallest to largest.

```
WHEN [Diameter] ='0.25' THEN  10
WHEN  [Diameter] = '0.375' THEN  10
WHEN  [Diameter] = '0.5' THEN  10
WHEN  [Diameter] = '0.75' THEN  10
WHEN  [Diameter] = '1' THEN  20
WHEN  [Diameter] = '1.25' THEN  20
WHEN  [Diameter] = '1.5' THEN  20
WHEN  [Diameter] = '1.75' THEN  20
WHEN  [Diameter] = '2' THEN  30
WHEN  [Diameter] = '2.5' THEN  30
WHEN  [Diameter] = '3' THEN  40
WHEN  [Diameter] = '4' THEN  50
WHEN  [Diameter] = '5' THEN  60
WHEN  [Diameter] = '6' THEN  70
WHEN  [Diameter] = '8' THEN  80
```

```
WHEN [Diameter] = '10' THEN 90
WHEN [Diameter] = '12' THEN 100
WHEN [Diameter] = '16' THEN 110
WHEN [Diameter] = '20' THEN 120
WHEN [Diameter] = '24' THEN 130
WHEN [Diameter] = '30' THEN 140
ELSE 140 END)
```

Summary: Testimony PUCO Case No. 14-1622-GA-ALT In the Matter of the Application of Duke Energy Ohio, Inc., for Approval of an Alternative Rate Plan Pursuant to Section 4929.05. Revised Code, for an Accelerated Service Line Replacement Program. Direct Testimony of John A. Hill, Jr. on Behalf of Duke Energy Ohio, Inc. electronically filed by Mrs. Debbie L Gates on behalf of Duke Energy Ohio Inc. and Spiller, Amy B and Kingery, Jeanne W