DUKE ENERGY OHIO EXHIBIT____

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc., for an Increase in Electric Distribution Rates.	)))	Case No. 17-32-EL-AIR
In the Matter of the Application of Duke Energy Ohio, Inc., for Tariff Approval.	)))	Case No. 17-33-EL-ATA
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods.	)))	Case No. 17-34-EL-AAM

DIRECT TESTIMONY OF

DONALD L. SCHNEIDER, JR.

ON BEHALF OF

DUKE ENERGY OHIO, INC.

_____ Management policies, practices, and organization

_____ Operating income

_____ Rate Base

_____ Allocations

_____ Rate of return

_____ Rates and tariffs

__X__ Other: Overview

March 16, 2017

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Attachment:

DLS-1: Ohio AMI Transition Analysis

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Donald L. Schneider, Jr., and my business address is 400 South Tryon Street, Charlotte, North Carolina 28202.

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

A. I am employed by Duke Energy Business Services LLC (DEBS), as General Manager, Advanced Metering Infrastructure (AMI) Program Management. DEBS provides various administrative and other services to Duke Energy Ohio, Inc., (Duke Energy Ohio or Company) and other affiliated companies of Duke Energy Corporation (Duke Energy).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Science Degree in Electrical Engineering from the University of Evansville in 1986. After graduation, I was employed by Duke Energy Indiana, Inc., (then known as Public Service Indiana) as an electrical engineer. Throughout my career, I have held various positions of increasing responsibility in the areas of engineering and operations, including distribution planning, distribution design, field operations, and capital budgets. Prior to my current role, I was General Manager, Midwest Premises Services, responsible for managing all of Duke Energy's Midwest Premises Services and Meter Reading departments. I was promoted to my current position in 2008.

Q. ARE YOU A REGISTERED PROFESSIONAL ENGINEER?

A. Yes. I have been registered as a professional engineer with the State Board of Registration for Professional Engineers in the state of Indiana since 1995.

Q. PLEASE DESCRIBE YOUR DUTIES AS GENERAL MANAGER, AMI PROGRAM MANAGEMENT.

A. As General Manager, AMI Program Management, my primary responsibility is managing the project execution of AMI-related projects and AMI systems operations for all Duke Energy jurisdictions. Prior to the merger between Duke Energy and Progress Energy, I was responsible for managing the project execution for both AMI and Distribution Automation (DA) deployments for all legacy Duke Energy jurisdictions.

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

A. Yes. I have provided written testimony in several prior Duke Energy Ohio SmartGrid Rider proceedings.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THESE PROCEEDINGS?

A. I will begin by providing a background on Duke Energy Ohio's AMI. Then I will describe the current state of the Company's AMI environment and some challenges to that environment and explain how the Company plans to address those challenges. Finally, I will discuss and quantify the benefits and costs associated with the Company's AMI proposal.

II. BACKGROUND ON DUKE ENERGY OHIO'S AMI ENVIRONMENT

Q. WHAT IS AMI?

A. AMI involves a two-way communication network between the utility and its meters that is used to provide operational efficiencies and to enable customer services not possible with metering programs involving walk-by or one-way communications network (drive-by) readings.

Q. DESCRIBE THE CURRENT AMI ENVIRONMENT FOR DUKE ENERGY OHIO.

A. Today, the Company has two AMI metering environments, which I will describe as the node and mesh environments. The node environment is composed of Echelon electric meters, Badger gas communication modules, and communication nodes that were originally manufactured by Ambient, which has since been acquired by Ericsson. The mesh environment is composed of Itron electric meters, Itron gas communications modules, Itron range extenders, and Cisco Connected Grid Routers (CGRs).

Q. HOW DO COMMUNICATIONS WORK IN THE AMI NODE ENVIRONMENT?

A. Echelon electric meters communicate with nodes via two-way, low-voltage power-line carrier technology, and Badger gas communication modules communicate with nodes via one-way wireless radiofrequency signals. Each node is equipped with a cellular modem that allows for data and signals to be sent to and received from the node environment. The devices within the node

environment are managed by head-end control systems. The Echelon Networked Energy Services (Echelon NES) head-end system manages Echelon AMI meters, the Badger Read Center manages the gas communication modules, and the Ambient Network Management System (Ambient NMS) manages the communication nodes.

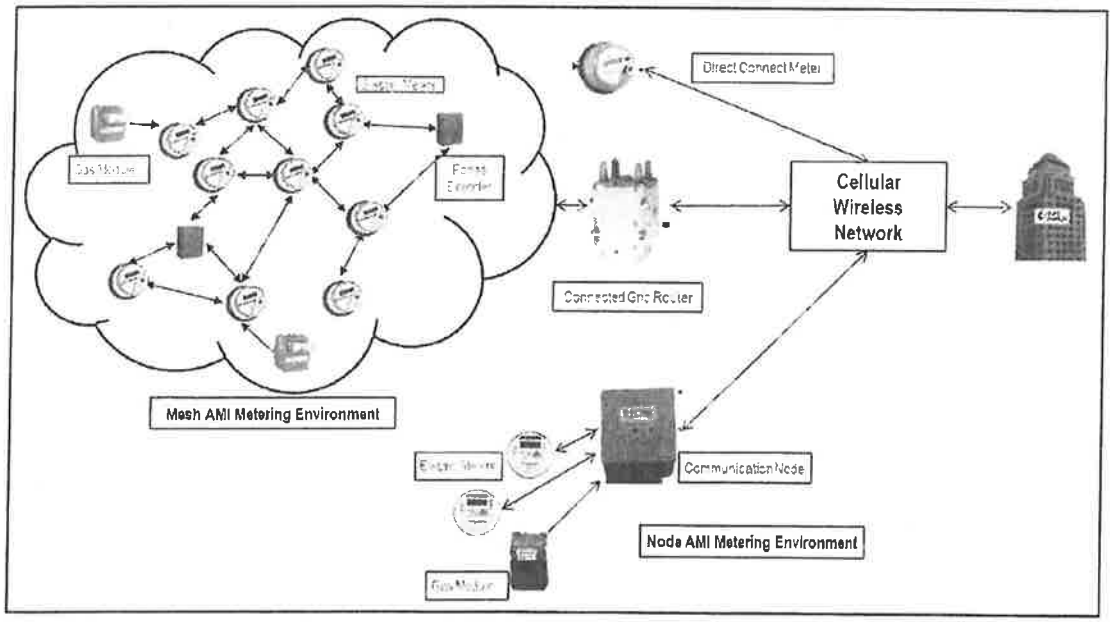
Q. HOW DO COMMUNICATIONS WORK IN THE AMI MESH ENVIRONMENT?

A. The mesh environment is so described because Itron electric meters communicate with one another and CGRs using wireless radiofrequency signals with IPv6 communication protocol, effectively forming a meshed communication network across a geographic area. Itron gas communication modules communicate with Itron electric AMI meters using a separate wireless radiofrequency signal that uses a communication protocol known as ZigBee, and that data is then carried over the mesh network to CGRs. Each CGR is equipped with a cellular modem that allows for data and signals to be sent to and received from the mesh environment. Itron range extenders are used in the mesh environment to help extend the wireless radiofrequency signal when necessary. The Itron OpenWay head-end system manages the Itron AMI meters and the Cisco Network Management System (CGNMS) manages the CGRs.

Figure 1 below illustrates Duke Energy Ohio's overall AMI network architecture. The mesh environment is depicted in the top left corner of the image. It shows gas modules communicating with electric meters and the electric meters communicating with one another and the CGR wirelessly. It then shows how the

CGR communicates through the cellular wireless network. The node environment is portrayed at the bottom of the image. It shows electric meters and gas modules communicating directly to a communication node, which also then communicates through the cellular wireless network. Finally, at the top of Figure 1 there is a depiction of an Itron Direct Connect electric AMI meter, which communicates directly over the cellular wireless network using a built-in cellular radio. The Direct Connect meters are used as an alternative for situations in which an Itron mesh electric meter at a specific premises cannot connect reliably with other mesh network meters in that area and it is cost prohibitive to extend the mesh utilizing Itron range extenders.

Figure 1:



Q. WHAT IS THE MAJOR DIFFERENCE BETWEEN THE AMI NODE AND MESH METERING ENVIRONMENTS?

A. Since the node environment utilizes low-voltage power-line carrier technology that requires installation of communication nodes at power transformers associated with the downstream electric meters, individual communication nodes only support about five electric AMI meters on average. In comparison, the mesh environment is typically designed so that 500 to 1,000 meters can communicate with a single CGR.

Q. WHAT CUSTOMER CLASSES ARE SERVED BY THE SEPARATE AMI ENVIRONMENTS?

A. The node environment serves most of Duke Energy Ohio's residential electric and residential combination gas and electric customers. The mesh environment serves most of the Company's commercial/industrial customer classes, as well as some residential customers. The mesh environment also serves some combination gas and electric customers in both the residential and commercial/industrial customer classes.

Q. WHY IS THERE A DIFFERENCE IN AMI ENVIRONMENTS BASED ON CUSTOMER TYPE?

A. Beginning in 2009, the Company installed the AMI node environment technology with electric meters manufactured by Echelon. Echelon began manufacturing AMI meters with the Form 2s Class 200 meter type, which is primarily used by residential customers. Echelon had planned to continue development of AMI electric meters for all other meter forms but the market never developed in North

America for this technology so they did not start manufacturing other meter forms. Therefore, the majority of Duke Energy Ohio's residential electric customers are served by an Echelon meter. After analyzing other AMI environments, the Company standardized on the Itron AMI mesh environment and installed electric AMI meters manufactured by Itron for most of its commercial/industrial electric customers and any additional customers who could not be served by an Echelon Form 2s Class 200 AMI meter. In some cases, such as when a customer requires demand readings, Duke Energy Ohio installed Itron AMI meters for residential electric customers as well.

Q. WHERE IS DUKE ENERGY OHIO'S AMI METER DATA STORED?

A. Duke Energy Ohio's AMI meter data is stored in two separate meter data management systems, which are responsible for processing and storing vast amounts of collected meter data. For the node environment, interval AMI Customer Energy Usage Data (CEUD) is stored in Oracle's first-generation meter data management system called the Energy Data Management System (EDMS). For the mesh environment, interval AMI CEUD is stored in Oracle's second-generation meter data management system, which Duke Energy Ohio calls MDM. Data in EDMS and MDM is used by Duke Energy Ohio's billing system known as the Customer Management System (CMS) for billing functions.

Q. DESCRIBE THE DIFFERENCES BETWEEN EDMS AND MDM WITH REGARD TO HOW THEY PROCESS INTERVAL AMI CEUD.

A. MDM provides scalable Validation, Estimation, & Editing (VEE) functionality for interval AMI CEUD. EDMS relies on the CMS system to provide scalable

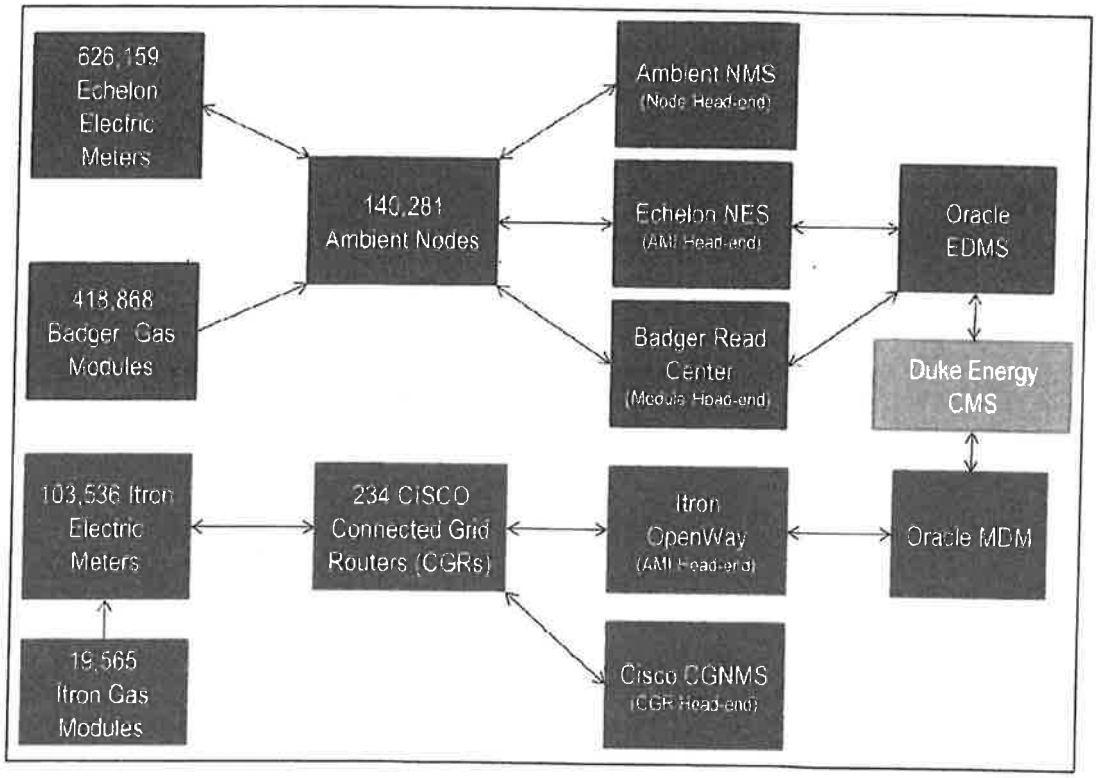
VEE functionality for interval AMI CEUD. Interval AMI CEUD coming out of the MDM system is considered billing-quality interval AMI CEUD, while interval AMI CEUD that comes out of EDMS is not considered billing-quality interval AMI CEUD.

III. CURRENT STATE OF THE COMPANY'S AMI ENVIRONMENT

Q. WHAT IS THE CURRENT BREAKDOWN OF DEVICES DEPLOYED ACROSS DUKE ENERGY OHIO'S TWO AMI METERING ENVIRONMENTS?

Figure 2 provides a visual representation of this device breakdown as of January 31, 2017. It also displays the respective head-ends, network management systems, and meter data management systems for the two AMI metering environments.

Figure 2:



Using figures as of January 31, 2017, 626,159 Echelon electric meters and 418,868 Badger gas communication modules communicate directly with 140.281 communication nodes in the node environment. As of the same date, 103,536 Itron electric meters communicate with 234 CGRs and 19,565 Itron gas communication modules communicate through the Itron electric meters to the CGRs in the mesh environment.

Q. IS DUKE ENERGY OHIO FACING ANY ISSUES WITH ITS AMI METERING ENVIRONMENTS?

A. In Duke Energy Ohio's AMI node environment, Ericsson is no longer manufacturing communication nodes. Duke Energy Ohio's inventory of nodes is therefore depleting beyond the desired stocking level with each device failure. Additionally, communication nodes have been failing at a higher rate than expected.

Q. WHAT IS DUKE ENERGY OHIO DOING TO ADDRESS THIS ISSUE IN THE NEAR TERM?

A. Duke Energy Ohio has begun a business continuity effort for the years 2017-2018 to remove approximately 23,700 communication nodes currently deployed in the field, in order to restore inventory back to desired stocking levels. Removing these nodes – transitioning from the AMI node environment to the mesh environment – requires expanding the footprint of the Company's existing mesh environment; consequently, the Company will replace approximately 80,000 Echelon electric meters and 48,800 Badger gas communication modules with Itron electric meters and Itron gas communication modules. Upon completion of the effort, the AMI node environment will contain approximately 546,000 Echelon electric meters, 370,000 Badger gas communication modules, and 120,000 communication nodes remaining in the field.

Q. WHAT IS THE ESTIMATED TIMELINE TO ADDRESS THIS NODE ISSUE AS DESCRIBED ABOVE?

A. The Company began expanding the mesh environment footprint in early 2017. This business continuity work is expected to conclude by the end of 2018.

IV. FUTURE STATE OF THE COMPANY'S AMI ENVIRONMENT

Q. PLEASE DESCRIBE ANY MAJOR HARDWARE UPGRADES REQUIRED FOR DUKE ENERGY OHIO'S AMI METERING ENVIRONMENTS IN THE COMING YEARS.

A. Verizon, the Company's primary cellular provider, has alerted the Company that their second generation (2G) and third generation (3G) cellular networks will be discontinued, or sunset, in 2022. Verizon originally planned to discontinue these networks earlier than 2022, but through Duke Energy's partnership with Verizon, it was agreed to extend the sunset to 2022. No further extension is expected. The 2G and 3G sunset will require Duke Energy Ohio to completely transition all of its communication devices – whether they are nodes or CGRs – to the Verizon 4G network prior to end of 2022. The 2G and 3G sunset applies to all users of the Verizon cellular network, including anyone using Verizon's personal cellular services.

Q. HOW DOES VERIZON'S DECISION TO DISCONTINUE SUPPORTING THE 2G AND 3G SYSTEMS AFFECT THE COMPANY'S AMI MESH ENVIRONMENT?

A. Cisco has already released a 4G CGR. Duke Energy Ohio will need to upgrade 233 of its current 234 CGRs to 4G communications technology before Verizon

ends its support. Upgrading a CGR involves swapping out the 3G communication card for a 4G communication card and replacing the CGR's antennas.

Q. HOW DOES VERIZON'S DECISION TO DISCONTINUE SUPPORTING THE 2G AND 3G SYSTEMS AFFECT THE COMPANY'S AMI NODE ENVIRONMENT?

A. The loss of support for 2G and 3G is a significant long-term challenge for Duke Energy Ohio's node environment due to the sheer volume of communication nodes. As I mentioned previously, there are far more communication nodes installed since the ratio of meters to nodes is so much lower than the ratio of meters to CGRs. The Company would need to upgrade at least 140,000 nodes. Adding to the challenge, I also mentioned that the communication nodes are no longer being manufactured, but the Company could work with the vendor to source a replacement 4G modem and antenna that could be retrofitted into the node. Upgrading a node to the 4G network is more complicated than the upgrade process for CGRs. The node design incorporates a cellular modem chip that is soldered onto the communication node's motherboard; so, it is a more delicate and labor-intensive process than what is required for CGRs, which incorporates a cellular modem card design.

Q. ARE THERE ANY OTHER LONG-TERM CHALLENGES IN SUPPORTING THE AMI NODE ENVIRONMENT?

A. Since the Company began its AMI deployment, Ambient has been purchased by Ericsson and Duke Energy Ohio remains the only customer utilizing the specific communication nodes that were manufactured by Ambient. While Echelon has

had success in other countries, Duke Energy Ohio remains the only North American company utilizing the Echelon AMI nodal solution. The failure of nodes, the lack of North American adoption, and the fact that the nodes are no longer manufactured are all factors that present risk to Duke Energy Ohio and its customers. Even if the Company were to upgrade all its communication nodes to the Verizon 4G network, the node failure issue would not be resolved. The nodes are already approaching the end of their expected 10 year useful lives. The Company would need to continue removing nodes and switching customers to the mesh environment, just for business continuity beyond 2018. The Company has a support contract in place for node repair but, with the higher than expected failure rates, Ericsson is not able to keep up with the repairs.

Q. HOW DOES DUKE ENERGY OHIO PLAN TO ADDRESS THE LONG-TERM CHALLENGE WITH THE NODE ENVIRONMENT?

A. Rather than upgrading the communication nodes to 4G and perpetuating the support concerns the Company is already confronting in the near-term, the Company proposes to transition entirely from the AMI node environment to the AMI mesh environment. The estimated total cost of the Ohio AMI Transition effort is approximately $143.4 million, most of which will be capital costs. The work would begin in 2019 and conclude by the end of 2022. Attachment DLS-1 shows the estimated costs of ownership/operation and a net present value (NPV) comparison of the Ohio AMI Transition effort versus retaining the node environment. I will discuss the benefits and costs of the Ohio AMI Transition in depth over the next two sections of testimony.

V. BENEFITS OF THE PROPOSED AMI TRANSITION

Q. WHAT ARE THE OVERARCHING BENEFITS OF COMPLETELY TRANSITIONING FROM THE NODE TO THE MESH AMI METERING ENVIRONMENT?

A. The Ohio AMI Transition would allow Duke Energy Ohio to avoid approximately $91.2 million in total costs to upgrade its AMI node environment to 4G, as shown on Attachment DLS-1. Having all meters in the Itron AMI mesh environment would mean that the Company would have billing-quality interval AMI CEUD for all its electric customers with AMI meters because Itron meters necessarily feed data into MDM rather than EDMS.

Going forward, support for the mesh environment will be significantly less costly – in terms of both avoided costs and reduced costs – than the cost of continuing to support the node environment. Attachment DLS-1 shows that the 20-year NPV of costs associated with keeping the node environment in place is approximately $190.3 million, while the 20-year NPV of costs associated with the Ohio AMI Transition is approximately $134.7 million.

Finally, the Ohio AMI Transition will better serve Duke Energy Ohio's customers, since we will be able to offer the full suite of Enhanced Basic Services described in the testimony of Company witness Dr. Alexander (Sasha) J. Weintraub.

Q. WHAT IS THE BENEFIT OF AVOIDING THE 4G UPGRADE COSTS FOR THE COMMUNICATION NODES?

A. Duke Energy Ohio would face significant costs to upgrade its communication nodes to 4G, an unavoidable upgrade if it continues using the AMI node environment. The Company estimates that it would cost approximately $91.2 million for the project, which would begin in 2019 and end in 2021. The Ohio AMI Transition will allow Duke Energy Ohio to avoid those costs by installing 4G CGRs and Itron AMI meters.

Q. WHAT IS THE BENEFIT OF HAVING BILLING-QUALITY INTERVAL AMI CEUD?

A. In his testimony in this case, Company witness Scott B. Nicholson explains the Company's plans to enhance the customer electricity experience and promote competition in Ohio. Mr. Nicholson describes the Company's current status and, consistent with Commission directive, plans for providing interval CEUD to CRES providers. The Ohio AMI Meter Transition will allow Duke Energy Ohio to pursue a comprehensive solution, since the electric Itron meters in MDM will have billing-quality interval AMI CEUD going forward. Once new meters are in place and the data can be certified as billing quality, the data can be provided to CRES providers. This, in turn, will allow the CRES providers to offer new products and services to allow customers to use the data to their best advantage.

Q. WHAT IS THE BENEFIT OF NO LONGER SUPPORTING THE NODE ENVIRONMENT?

A. If Duke Energy Ohio does not receive necessary regulatory approval and has to continue with the node environment instead of undertaking the Ohio AMI Meter Transition, the Company estimates it would spend $1 million in 2019 just to develop a long-term solution to address the node failure issue. At that point, the business continuity effort will have concluded. but the node failure rate is expected to continue increasing.

Besides addressing the node failure issue, the future costs to support the node environment and its related systems would be avoided or reduced if the Company pursues the Ohio AMI Meter Transition. Duke Energy Ohio would spend less in annual on-going operation and maintenance (O&M) costs if it transitions the entire node environment to the mesh environment. That includes reduced costs for monthly cellular contracts and for managing communication node failures, as well as avoided costs for system upgrades and vendor maintenance.

Q. WHAT IS THE BENEFIT OF BEING ABLE TO OFFER ENHANCED BASIC SERVICES THROUGH THE MESH ENVIRONMENT?

A. With all of its AMI meters part of the mesh environment, Duke Energy Ohio would be able to offer the full suite of Enhanced Basic Services described in the testimony of Company witness Weintraub, subject to any necessary regulatory approvals.

VI. COSTS OF THE PROPOSED AMI TRANSITION

Q. WHAT IS THE ESTIMATED COST AND TIMELINE FOR THE OHIO AMI TRANSITION?

A. Duke Energy Ohio estimates that the Ohio AMI Transition will cost approximately $143.4 million, most of which will be capital costs. Attachment DLS-1 shows a breakdown of project costs between electric, gas, communications, and software by capital and O&M. The deployment would begin in 2019 and conclude in 2022.

Q. WHAT PORTION OF THE TOTAL OHIO AMI METER TRANSITION COSTS IS FOR ELECTRIC SERVICE AND GAS SERVICE?

A. About $106.5 million of total costs for the Ohio AMI Transition are attributable to electric service. Just under $36.9 million of total costs are attributable to gas service.

Q. HOW DO THE COSTS OF THE BUSINESS CONTINUITY EFFORT AND OHIO AMI TRANSITION COMPARE TO THE BENEFITS OF AVOIDING THE NODE ENVIRONMENT COSTS?

A. As mentioned earlier, Attachment DLS-1 shows that the NPV of costs to maintain the node environment from 2019 through 2038 is $190.2 million versus $134.7 million to pursue the Ohio AMI Transition over the same time period. The 20-year NPV analysis was used in alignment with typical internal cost analyses.

VII. CONCLUSION

Q. WAS ATTACHMENT DLS-1 PREPARED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes.

Q. IS THE INFORMATION CONTAINED IN ATTACHMENT DLS-1 TRUE AND ACCURATE TO THE BEST OF YOUR KNOWLEDGE AND BELIEF?

A. Yes.

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

A. Yes.

Total (All Electric and Gas Costs)

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	78,694,632	91,162,500
		EDMS to MDM Conversion	14,140,117	15,800,000
		Long-term Communication Node Solution	928,247	1,000,000
		NES Headend Upgrades	5,123,981	10,589,310
		Monthly Cellular Cost	15,487,719	33,216,510
		Communication Device Failures	49,779,269	118,383,860
		Vendor Maintenance	26,129,276	56,039,456
			190,283,240	326,191,636
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	123,299,685	143,398,848
	O&M	Monthly Cellular Cost	6,418,755	14,237,970
		Communication Device Failures	372,557	930,746
		Vendor Maintenance	4,615,356	10,644,198
			134,706,353	169,211,762

Electric Costs Only

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	69,487,360	80,496,488
		EDMS to MDM Conversion	8,625,471	9,638,000
		Long-term Communication Node Solution	566,230	610,000
		NES Headend Upgrades	5,123,981	10,589,310
		Monthly Cellular Cost	9,447,509	20,262,071
		Communication Device Failures	43,955,094	104,532,948
		Vendor Maintenance	19,073,436	40,906,796
			156,279,082	267,035,613
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	91,584,689	106,505,554
	O&M	Monthly Cellular Cost	3,915,440	8,685,162
		Communication Device Failures	328,968	821,849
		Vendor Maintenance	3,528,090	8,141,157
			99,357,188	124,153,722

Gas Costs Only

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	9,207,272	10,666,013
		EDMS to MDM Conversion	5,514,645	6,162,000
		Long-term Communication Node Solution	362,016	390,000
		NES Headend Upgrades	-	-
		Monthly Cellular Cost	6,040,211	12,954,439
		Communication Device Failures	5,824,174	13,850,911
		Vendor Maintenance	7,055,839	15,132,659
			34,004,158	59,156,021
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	31,714,995	36,893,294
	O&M	Monthly Cellular Cost	2,503,314	5,552,808
		Communication Device Failures	43,589	108,896
		Vendor Maintenance	1,087,267	2,503,044
			35,349,165	45,058,042

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BEFORE

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In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Establish a Standard Service Offer Pursuant to Section 4928.143, Revised Code, in the Form of an Electric Security Plan, Accounting Modifications and Tariffs for Generation Service.	)	Case No. 17-1263-EL-SSO
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Amend its Certified Supplier Tariff, P.U.C.O. No. 20.	)	Case No. 17-1264-EL-ATA
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Defer Vegetation Management Costs.	)	Case No. 17-1265-EL-AAM

DIRECT TESTIMONY OF

DONALD L. SCHNEIDER, JR.

ON BEHALF OF

DUKE ENERGY OHIO, INC.

June 1, 2017

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

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A. I received a Bachelor of Science Degree in Electrical Engineering from the University of Evansville in 1986. After graduation, I was employed by Duke Energy Indiana, Inc., (then known as Public Service Indiana) as an electrical engineer. Throughout my career, I have held various positions of increasing responsibility in the areas of engineering and operations, including distribution planning, distribution design, field operations, and capital budgets. Prior to my current role, I was General Manager, Midwest Premises Services, responsible for managing all of Duke Energy's Midwest Premises Services and Meter Reading departments. I was promoted to my current position in 2008.

Q. ARE YOU A REGISTERED PROFESSIONAL ENGINEER?

A. Yes. I have been registered as a professional engineer with the State Board of Registration for Professional Engineers in the state of Indiana since 1995.

Q. PLEASE DESCRIBE YOUR DUTIES AS GENERAL MANAGER, AMI PROGRAM MANAGEMENT.

A. As General Manager, AMI Program Management, my primary responsibility is managing the project execution of AMI-related projects and AMI systems operations for all Duke Energy jurisdictions. Prior to the merger between Duke Energy and Progress Energy, I was responsible for managing the project execution for both AMI and Distribution Automation (DA) deployments for all legacy Duke Energy jurisdictions.

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

A. Yes. I have submitted pre-filed testimony and have testified before the Public Utilities Commission of Ohio (Commission).

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THESE PROCEEDINGS?

A. I will begin by providing a background on Duke Energy Ohio's AMI. Then I will describe the current state of the Company's AMI environment and some challenges to that environment and explain how the Company plans to address those challenges. Finally, I will discuss and quantify the benefits and costs associated with the Company's AMI proposal.

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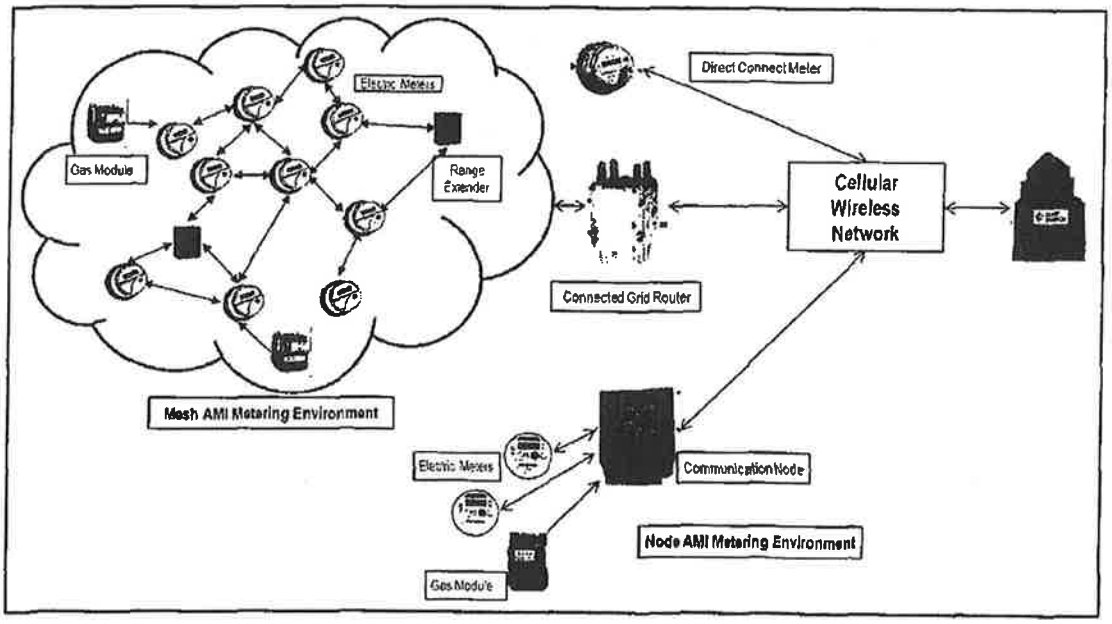
Q. HOW DO COMMUNICATIONS WORK IN THE AMI MESH ENVIRONMENT?

A. The mesh environment is so described because Itron electric meters communicate with one another and CGRs using wireless radiofrequency signals with IPv6 communication protocol, effectively forming a meshed communication network across a geographic area. Itron gas communication modules communicate with Itron electric AMI meters using a separate wireless radiofrequency signal that uses a communication protocol known as ZigBee and that data is then carried over the mesh network to CGRs. Each CGR is equipped with a cellular modem that allows for data and signals to be sent to and received from the mesh environment. Itron range extenders are used in the mesh environment to help extend the wireless radiofrequency signal when necessary. The Itron OpenWay head-end system manages the Itron AMI meters and the Cisco Network Management System (CGNMS) manages the CGRs.

Figure 1 below illustrates Duke Energy Ohio's overall AMI network architecture. The mesh environment is depicted in the top left corner of the image. It shows gas modules communicating with electric meters and the electric meters communicating with one another and the CGR wirelessly. It then shows how the

CGR communicates through the cellular wireless network. The node environment is portrayed at the bottom of the image. It shows electric meters and gas modules communicating directly to a communication node, which also then communicates through the cellular wireless network. Finally, at the top of Figure 1 there is a depiction of an Itron Direct Connect electric AMI meter, which communicates directly over the cellular wireless network using a built-in cellular radio. The Direct Connect meters are used as an alternative for situations in which an Itron mesh electric meter at a specific premises cannot connect reliably with other mesh network meters in that area and it is cost prohibitive to extend the mesh utilizing Itron range extenders.

Figure 1:



Q. WHAT IS THE MAJOR DIFFERENCE BETWEEN THE AMI NODE AND MESH METERING ENVIRONMENTS?

A. Since the node environment utilizes low-voltage power-line carrier technology that requires installation of communication nodes at power transformers associated with the downstream electric meters, individual communication nodes only support about five electric AMI meters on average. In comparison, the mesh environment is typically designed so that 500 to 1,000 meters can communicate with a single CGR.

Q. WHAT CUSTOMER CLASSES ARE SERVED BY THE SEPARATE AMI ENVIRONMENTS?

A. The node environment serves most of Duke Energy Ohio's residential electric and residential combination gas and electric customers. The mesh environment serves most of the Company's commercial/industrial customer classes, as well as some residential customers. The mesh environment also serves some combination gas and electric customers in both the residential and commercial/industrial customer classes.

Q. WHY IS THERE A DIFFERENCE IN AMI ENVIRONMENTS BASED ON CUSTOMER TYPE?

A. Beginning in 2009, the Company installed the AMI node environment technology with electric meters manufactured by Echelon. Echelon began manufacturing AMI meters with the Form 2s Class 200 meter type, which is primarily used by residential customers. Echelon had planned to continue development of AMI electric meters for all other meter forms but the market never developed in North

America for this technology so they did not start manufacturing other meter forms. Therefore, the majority of Duke Energy Ohio's residential electric customers are served by an Echelon meter. After analyzing other AMI environments, the Company standardized on the Itron AMI mesh environment and installed electric AMI meters manufactured by Itron for most of its commercial/industrial electric customers and any additional customers who could not be served by an Echelon Form 2s Class 200 AMI meter. In some cases, such as when a customer requires demand readings, Duke Energy Ohio installed Itron AMI meters for residential electric customers as well.

Q. WHERE IS DUKE ENERGY OHIO'S AMI METER DATA STORED?

A. Duke Energy Ohio's AMI meter data is stored in two separate meter data management systems, which are responsible for processing and storing vast amounts of collected meter data. For the node environment, interval AMI customer energy usage data (CEUD) is stored in Oracle's first-generation meter data management system called the Energy Data Management System (EDMS). For the mesh environment, interval AMI CEUD is stored in Oracle's second-generation meter data management system, which Duke Energy Ohio calls MDM. Data in EDMS and MDM is used by Duke Energy Ohio's billing system known as the Customer Management System (CMS) for billing functions.

Q. DESCRIBE THE DIFFERENCES BETWEEN EDMS AND MDM WITH REGARD TO HOW THEY PROCESS INTERVAL AMI CEUD.

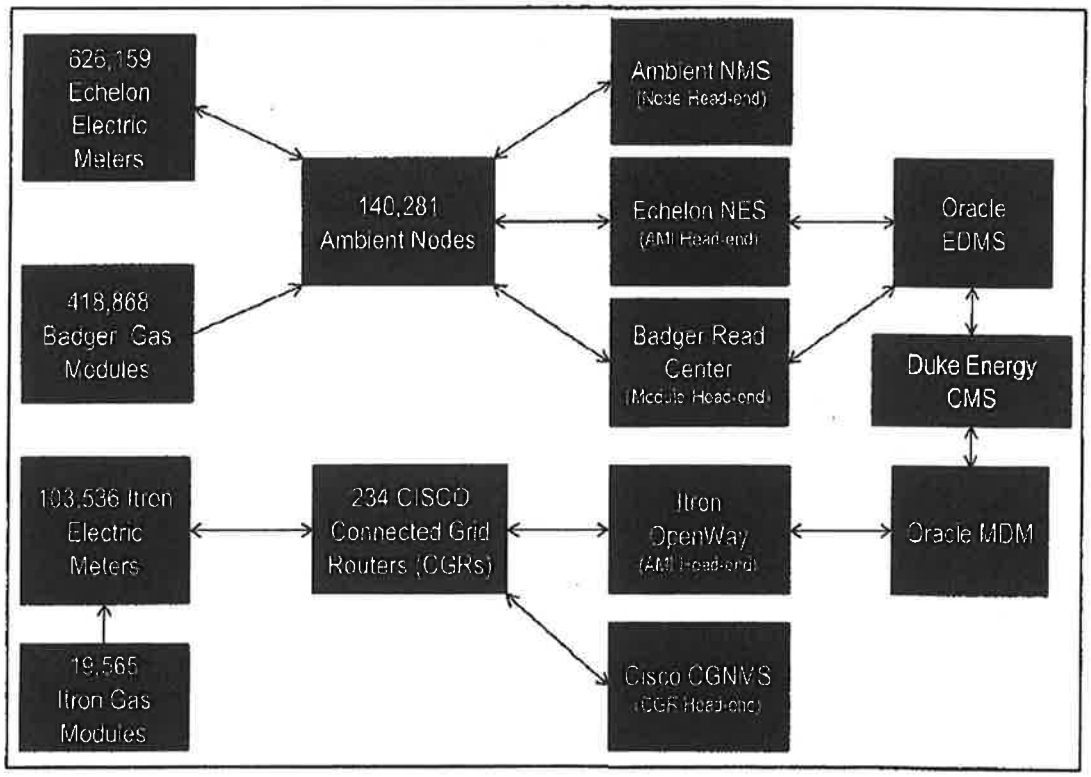
A. MDM provides scalable Validation, Estimation, & Editing (VEE) functionality for interval AMI CEUD. EDMS relies on the CMS to provide scalable VEE

functionality for interval AMI CEUD. Interval AMI CEUD coming out of the MDM system is considered billing-quality interval AMI CEUD, while interval AMI CEUD that comes out of EDMS is not considered billing-quality interval AMI CEUD.

Q. WHAT IS THE CURRENT BREAKDOWN OF DEVICES DEPLOYED ACROSS DUKE ENERGY OHIO'S TWO AMI METERING ENVIRONMENTS?

A. Figure 2 provides a visual representation of this device breakdown as of January 31, 2017. It also displays the respective head-ends, network management systems, and meter data management systems for the two AMI metering environments.

Figure 2:



Using figures as of January 31, 2017, 626,159 Echelon electric meters and 418,868 Badger gas communication modules communicate directly with 140,281 communication nodes in the node environment. As of the same date, 103,536 Itron electric meters communicate with 234 CGRs and 19,565 Itron gas communication modules communicate through the Itron electric meters to the CGRs in the mesh environment.

Q. IS DUKE ENERGY OHIO FACING ANY ISSUES WITH ITS AMI METERING ENVIRONMENTS?

A. In Duke Energy Ohio's AMI node environment, Ericsson is no longer manufacturing communication nodes. Duke Energy Ohio's inventory of nodes is therefore depleting beyond the desired stocking level with each device failure. Additionally, communication nodes have been failing at a higher rate than expected.

Q. WHAT IS DUKE ENERGY OHIO DOING TO ADDRESS THIS ISSUE IN THE NEAR TERM?

A. Duke Energy Ohio has begun a business continuity effort for the years 2017-2018 to remove approximately 23,700 communication nodes currently deployed in the field, in order to restore inventory back to desired stocking levels. Removing these nodes – transitioning from the AMI node environment to the mesh environment – requires expanding the footprint of the Company's existing mesh environment; consequently, the Company will replace approximately 80,000 Echelon electric meters and 48,800 Badger gas communication modules with Itron electric meters and Itron gas communication modules. Upon completion of the effort, the AMI

node environment will contain approximately 546,000 Echelon electric meters, 370,000 Badger gas communication modules, and 120,000 communication nodes remaining in the field.

Q. WHAT IS THE ESTIMATED TIMELINE TO ADDRESS THIS NODE ISSUE AS DESCRIBED ABOVE?

A. The Company began expanding the mesh environment footprint in early 2017. This business continuity work is expected to conclude by the end of 2018.

III. FUTURE STATE OF THE COMPANY'S AMI ENVIRONMENT

Q. PLEASE DESCRIBE HARDWARE UPGRADES REQUIRED FOR DUKE ENERGY OHIO'S AMI METERING ENVIRONMENTS IN THE COMING YEARS.

A. Verizon, the Company's primary cellular provider, has alerted the Company that their second generation (2G) and third generation (3G) cellular networks will be discontinued, or sunset, in 2022. Verizon originally planned to discontinue these networks earlier than 2022, but through Duke Energy's partnership with Verizon, it was agreed to extend the sunset to 2022. No further extension is expected. The 2G and 3G sunset will require Duke Energy Ohio to completely transition all of its communication devices – whether they are nodes or CGRs – to the Verizon 4G network prior to end of 2022. The 2G and 3G sunset applies to all users of the Verizon cellular network, including anyone using Verizon's personal cellular services.

Q. HOW DOES VERIZON'S DECISION TO DISCONTINUE SUPPORTING THE 2G AND 3G SYSTEMS AFFECT THE COMPANY'S AMI MESH ENVIRONMENT?

A. Cisco has already released a 4G CGR. Duke Energy Ohio will need to upgrade 233 of its current 234 CGRs to 4G communications technology before Verizon ends its support. Upgrading a CGR involves swapping out the 3G communication card for a 4G communication card and replacing the CGR's antennas.

Q. HOW DOES VERIZON'S DECISION TO DISCONTINUE SUPPORTING THE 2G AND 3G SYSTEMS AFFECT THE COMPANY'S AMI NODE ENVIRONMENT?

A. The loss of support for 2G and 3G is a significant long-term challenge for Duke Energy Ohio's node environment due to the sheer volume of communication nodes. As I mentioned previously, there are far more communication nodes installed since the ratio of meters to nodes is so much lower than the ratio of meters to CGRs. The Company would need to upgrade at least 140,000 nodes. Adding to the challenge, the communication nodes are no longer being manufactured, but the Company could work with the vendor to source a replacement 4G modem and antenna that could be retrofitted into the node. Upgrading a node to the 4G network is more complicated than the upgrade process for CGRs. The node design incorporates a cellular modem chip that is soldered onto the communication node's motherboard; so, it is a more delicate and labor-intensive process than what is required for CGRs, which incorporates a cellular modem card design.

Q. ARE THERE ANY OTHER LONG-TERM CHALLENGES IN SUPPORTING THE AMI NODE ENVIRONMENT?

A. Since the Company began its AMI deployment, Ambient has been purchased by Ericsson and Duke Energy Ohio remains the only customer utilizing the specific communication nodes that were manufactured by Ambient. While Echelon has had success in other countries, Duke Energy Ohio remains the only North American company utilizing the Echelon AMI nodal solution. The high failure rate of nodes, the lack of North American adoption, and the fact that the nodes are no longer manufactured are all factors that present risk to Duke Energy Ohio and its customers. Even if the Company were to upgrade all its communication nodes to the Verizon 4G network, the node failure issue would not be resolved. The nodes are already approaching the end of their expected 10-year useful life. The Company would need to continue removing nodes and switching customers to the mesh environment, just for business continuity beyond 2018. The Company has a support contract in place for node repair but, with the higher than expected failure rates, Ericsson is not able to keep up with the repairs.

Q. HOW DOES DUKE ENERGY OHIO PLAN TO ADDRESS THE LONG-TERM CHALLENGE WITH THE NODE ENVIRONMENT?

A. Rather than upgrading the communication nodes to 4G and perpetuating the support concerns the Company is already confronting in the near-term, the Company proposes to transition entirely from the AMI node environment to the AMI mesh environment (Ohio AMI Transition). The estimated total cost of the Ohio AMI Transition effort is approximately $143.4 million, most of which will

be capital costs. The work would begin in 2019 and conclude by the end of 2022. Attachment DLS-1 shows the estimated costs of ownership/operation and a net present value (NPV) comparison of the Ohio AMI Transition effort versus retaining the node environment. I will discuss the benefits and costs of the Ohio AMI Transition in depth over the next two sections of testimony.

IV. BENEFITS OF THE PROPOSED AMI TRANSITION

Q. WHAT ARE THE OVERARCHING BENEFITS OF COMPLETELY TRANSITIONING FROM THE NODE TO THE MESH AMI METERING ENVIRONMENT?

A. The Ohio AMI Transition would allow Duke Energy Ohio to avoid approximately $91.2 million in total costs to upgrade its AMI node environment to 4G, as shown on Attachment DLS-1. Having all meters in the Itron AMI mesh environment would mean that the Company would have billing-quality interval AMI CEUD for all its electric customers with AMI meters because Itron meters necessarily feed data into MDM rather than EDMS.

Going forward, support for the mesh environment will be significantly less costly – in terms of both avoided costs and reduced costs – than the cost of continuing to support the node environment. Attachment DLS-1 shows that the 20-year NPV of costs associated with keeping the node environment in place is approximately $190.3 million, while the 20-year NPV of costs associated with the Ohio AMI Transition is approximately $134.7 million.

Additionally, the Ohio AMI Transition would position the Company to provide its customers with programs and services of importance to them, which I

understand is consistent with the Commission's PowerForward initiative and its intention to consider ways in which to transform the electric distribution grid and enhance the customer experience.

Q. WHAT IS THE BENEFIT OF AVOIDING THE 4G UPGRADE COSTS FOR THE COMMUNICATION NODES?

A. Duke Energy Ohio would face significant costs to upgrade its communication nodes to 4G, an unavoidable upgrade if it continues using the AMI node environment. The Company estimates that it would cost approximately $91.2 million for the project, which would begin in 2019 and end in 2021. The Ohio AMI Transition will allow Duke Energy Ohio to avoid those costs by installing 4G CGRs and Itron AMI meters.

Q. WHAT IS THE BENEFIT OF NO LONGER SUPPORTING THE NODE ENVIRONMENT?

A. If Duke Energy Ohio does not receive necessary regulatory approval and has to continue with the node environment instead of undertaking the Ohio AMI Meter Transition, the Company estimates it would spend $1 million in 2019 just to develop a long-term solution to address the node failure issue. At that point, the business continuity effort will have concluded, but the node failure rate is expected to continue increasing.

Besides addressing the node failure issue, the future costs to support the node environment and its related systems would be avoided or reduced if the Company pursues the Ohio AMI Meter Transition. Duke Energy Ohio would spend less in annual on-going operation and maintenance (O&M) costs if it

transitions the entire node environment to the mesh environment. That includes reduced costs for monthly cellular contracts and for managing communication node failures, as well as avoided costs for system upgrades and vendor maintenance.

V. COSTS OF THE PROPOSED AMI TRANSITION

Q. WHAT IS THE ESTIMATED COST AND TIMELINE FOR THE OHIO AMI TRANSITION?

A. Duke Energy Ohio estimates that the Ohio AMI Transition will cost approximately $143.4 million, most of which will be capital costs. Attachment DLS-1 shows a breakdown of project costs between electric, gas, communications, and software by capital and O&M. The deployment would begin in 2019 and conclude in 2022.

Q. WHAT PORTION OF THE TOTAL OHIO AMI METER TRANSITION COSTS IS FOR ELECTRIC SERVICE AND GAS SERVICE?

A. About $106.5 million of total costs for the Ohio AMI Transition are attributable to electric service. Just under $36.9 million of total costs are attributable to gas service.

Q. HOW DO THE COSTS OF THE BUSINESS CONTINUITY EFFORT AND OHIO AMI TRANSITION COMPARE TO THE BENEFITS OF AVOIDING THE NODE ENVIRONMENT COSTS?

A. As mentioned earlier, Attachment DLS-1 shows that the NPV of costs to maintain the node environment from 2019 through 2038 is $190.2 million versus $134.7

million to pursue the Ohio AMI Transition over the same time period. The 20-year NPV analysis was used in alignment with typical internal cost analyses.

Q. IS THE COMPANY PROPOSING TO RECOVER ANY OF THE COSTS OF THE OHIO AMI TRANSITION IN THESE PROCEEDINGS?

A. As discussed in the Direct Testimony of witness William Don Wathen Jr., capital expenditures associated with the Ohio AMI Transition would be recovered through Rider DCI, expanded to include distribution-related general, intangible, and common plant, as proposed in these proceedings. O&M costs would be recovered under the proposed PowerForward Rider, to the extent not otherwise recovered in base rates.

VI. CONCLUSION

Q. WAS ATTACHMENT DLS-1 PREPARED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes.

Q. IS THE INFORMATION CONTAINED IN ATTACHMENT DLS-1 TRUE AND ACCURATE TO THE BEST OF YOUR KNOWLEDGE AND BELIEF?

A. Yes.

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

A. Yes.

Total (All Electric and Gas Costs)

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	78,694,632	91,162,500
		EDMS to MDM Conversion	14,140,117	15,800,000
		Long-term Communication Node Solution	928,247	1,000,000
		NES Headend Upgrades	5,123,981	10,589,310
		Monthly Cellular Cost	15,487,719	33,216,510
		Communication Device Failures	49,779,269	118,383,860
		Vendor Maintenance	26,129,276	56,039,456
			190,283,240	326,191,636
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	123,299,685	143,398,848
	O&M	Monthly Cellular Cost	6,418,755	14,237,970
		Communication Device Failures	372,557	930,746
		Vendor Maintenance	4,615,356	10,644,198
			134,706,353	169,211,762

Electric Costs Only

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	69,487,360	80,496,488
		EDMS to MDM Conversion	8,625,471	9,638,000
		Long-term Communication Node Solution	566,230	610,000
		NES Headend Upgrades	5,123,981	10,589,310
		Monthly Cellular Cost	9,447,509	20,262,071
		Communication Device Failures	43,955,094	104,532,948
		Vendor Maintenance	19,073,436	40,906,796
			156,279,082	267,035,613
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	91,584,689	106,505,554
				-
	O&M	Monthly Cellular Cost	3,915,440	8,685,162
		Communication Device Failures	328,968	821,849
		Vendor Maintenance	3,528,090	8,141,157
			99,357,188	124,153,722

Gas Costs Only

Discount Rate (DEO before tax)	7.73%

			NPV	TOTAL (2019-2038)
		Continue Node Environment		
	O&M	4G Communication Node Upgrade	9,207,272	10,666,013
		EDMS to MDM Conversion	5,514,645	6,162,000
		Long-term Communication Node Solution	362,016	390,000
		NES Headend Upgrades	-	-
		Monthly Cellular Cost	6,040,211	12,954,439
		Communication Device Failures	5,824,174	13,850,911
		Vendor Maintenance	7,055,839	15,132,658
			34,004,158	59,156,021
		Transition to Mesh Environment		
	Capital	Ohio AMI Transition	31,714,995	36,893,294
				-
	O&M	Monthly Cellular Cost	2,503,314	5,552,808
		Communication Device Failures	43,589	108,896
		Vendor Maintenance	1,087,267	2,503,044
			35,349,165	45,058,042

Duke Energy Ohio
Case No. 17-0032-EL-AIR
OCC Sixth Set of Interrogatories
Date Received: June 2, 2017

OCC-INT-06-123

REQUEST:

According to the response to OCC-INT-02-007, Duke Energy's proposed AMI investments to replace the Echelon meters and the EDMS is a "marketable proven AMI solution that Duke has chosen to standardize across all jurisdictions." Please provide the information about this statement:

a. What corporate entity developed the "AMI solution" referenced in this response?
b. What "jurisdictions" are referred to in this response?
c. Define the term "marketable" as used in your response.
d. With regard to the "AMI solution" referenced in this response, identify the status of the implementation of this "solution" in "all jurisdictions." In your response, describe the status of any changes or proposals for AMI deployment or upgraded AMI systems in each of Duke's "jurisdictions" by identifying and providing any communications, proposals, applications, or other indicia of changes submitted to the applicable state regulatory agency with regard to the AMI system currently in place or proposed to be implemented for each jurisdiction.

RESPONSE:

a. The AMI solution referenced is an Itron Corporation product.
b. All Duke Energy jurisdictions (Ohio, Indiana, Kentucky, North Carolina, South Carolina, Florida)
c. A standardized mature product sold and marketed by a vendor partner.
d. Objection. This Interrogatory is overly broad and unduly burdensome, given that it seeks information that is unlimited as to time and that is neither relevant to this proceeding nor likely to lead to the discovery of admissible evidence in this proceeding. Issues related to proceedings in jurisdictions other than Ohio have no connection with Duke Energy Ohio's application for approval of its electric ratesand would constitute inadmissible hearsay.

PERSON RESPONSIBLE: As to responses a, b, c: Don L. Schneider, Jr.
As to objection d.: Legal

Duke Energy Ohio
Case No. 17-1263-EL-SSO
OCC Fourth Set Interrogatories
Date Received: August 31, 2017

OCC-INT-04-219

REQUEST:

Referring to Mr. Schneider's testimony, page 12, when did Duke become aware that it was the only customer utilizing specific communication modes manufactured by Ambient?

RESPONSE:

Objection. This Interrogatory is overly broad, unduly burdensome, and designed to elicit information that is both irrelevant and not reasonably calculated to lead to the discovery of admissible evidence. Moreover, this Interrogatory refers to communication modes and thus forces Duke Energy Ohio to engage in impermissible speculation and guesswork with regard to its intended meaning. Without waiving said objection, to the extent discoverable, and assuming OCC intended to refer to "communication nodes," Duke Energy knew from the start of its AMI deployment in Ohio that it was the first to install the Ambient node solution in North America.

PERSON RESPONSIBLE: As to Objection: Legal
As to Response: Donald L. Schneider, Jr.

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc. to Adjust Rider DR-IM and Rider AU for 2012 SmartGrid Costs.	)))	Case No. 13-1141-GE-RDR

SUPPLEMENTAL DIRECT TESTIMONY OF

DONALD L. SCHNEIDER, JR.

ON BEHALF OF

DUKE ENERGY OHIO, INC.

January 29, 2014

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Donald L. Schneider, Jr., and my business address is 400 South Tryon Street, Charlotte, North Carolina, 28201.

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

A. I am employed by Duke Energy Business Services LLC, an affiliate of Duke Energy Ohio, Inc. (Duke Energy Ohio or Company), as Director, Advanced Metering in our Grid Modernization – Project Execution organization.

Q. ARE YOU THE SAME DONALD L. SCHNEIDER, JR. WHO FILED DIRECT TESTIMONY IN THIS PROCEEDING ON JUNE 28, 2013?

A. Yes.

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

A. The purpose of my supplemental direct testimony is to respond to some of the points raised in the testimony filed by Direct Energy Business, LLC, and Direct Energy Services, LLC, (Direct Energy) that was filed on January 10, 2014. Specifically, I will provide information in an effort to dispel the confusion that seems to exist with respect to the Company's meter data management systems and its ability to interact with Competitive Retail Electric Service providers (CRES providers).

II. METER DATA MANAGEMENT SYSTEM

Q. DIRECT ENERGY WITNESS JENNIFER L. LAUSE ARGUES THAT DUKE ENERGY OHIO SHOULD IMPLEMENT A METER DATA MANAGEMENT

(MDM) SYSTEM. HAS DUKE ENERGY OHIO IMPLEMENTED A MDM SYSTEM?

A. Direct Energy witness Jennifer L. Lause argues that the Commission should not approve a stipulation unless Duke Energy Ohio implements an MDM System. However, Duke Energy Ohio has already implemented first and second generation MDM Systems.

Q. WHY DID DUKE ENERGY OHIO IMPLEMENT FIRST AND SECOND GENERATION MDM SYSTEMS?

A. Duke Energy Ohio implemented its first generation MDM System in preparation for its initial pre-scale Advanced Metering Infrastructure (AMI) deployment. In 2013, Duke Energy Ohio became aware of new technology that would better suit the needs of the Company and customers. This technology had not been available at the time of the Company's initial pre-scale AMI deployment. The second generation MDM System has functionalities which were not industry standard at the time the first generation MDM System was implemented. It was determined that the second generation MDM System was a better choice for the Company and for its customers.

Q. WHAT FUNCTIONALITIES ARE POSSIBLE IN THE SECOND GENERATION MDM SYSTEM THAT ARE NOT POSSIBLE WITH THE FIRST GENERATION MDM SYSTEM?

A. Duke Energy Ohio's first generation MDM System does not have scalable Validation, Estimate, & Edit (VEE) functionality for hourly-interval customer usage AMI data. Duke Energy Ohio's second generation MDM System does have scalable VEE functionality for hourly-interval customer usage AMI data. As a result, billing-quality

hourly-interval customer usage AMI data is available from the second generation MDM System, but not from the first generation MDM System, on a scalable basis

III. AVAILABILITY OF CUSTOMER DATA

Q. HOW WILL CRES PROVIDERS ACCESS HOURLY-INTERVAL CUSTOMER USAGE AMI DATA?

A. Pursuant to a Stipulation and Recommendation in Case No. 11-3549-EL-SSO, *et al.*, Duke Energy Ohio's second Electric Security Plan proceeding, the Company is enhancing the existing web portal (CRES Portal) that will improve interaction with CRES providers and allow online access to customer data with proper authorization. The Company is currently finalizing the internet technology required to allow this enhancement to the CRES Portal to be available. Some of the details of interacting with CRES providers, including appropriate authorization, are still being developed by the Commission in a rulemaking proceeding. Also, the Commission opened a docket to consider enhancements to the competitive electric retail service market and the Staff has submitted recommendations that also impact the CRES Portal.

Q. WHAT INTERVAL CUSTOMER USAGE AMI DATA WILL BE AVAILABLE WITH THE CRES PORTAL ENHANCEMENTS ON JUNE 1, 2014?

A. Duke Energy Ohio's CRES Portal enhancements, planned for June 1, 2014, will enable Duke Energy Ohio to provide interval customer usage AMI data from both MDM Systems to CRES providers via the CRES Portal, with an indicator if the AMI data are not billing-quality interval customer usage AMI data that have been processed through VEE. The interval customer usage AMI data will be in hourly intervals and will be updated monthly after each account bills. CRES providers will be able to export hourly-

interval customer usage AMI data from the CRES Portal in flat file (*e.g.* Excel, CSV, comma delimited, etc.) format on a meter-by-meter basis.

Q. WHAT INTERVAL CUSTOMER USAGE AMI DATA MAY BE AVAILABLE THROUGH ELECTRONIC DATA INTERCHANGE (EDI) ENHANCEMENTS?

A. Duke Energy Ohio is considering EDI enhancements that have not been internally approved. If Duke Energy Ohio's EDI enhancements are internally approved and if cost recovery is provided, Duke Energy Ohio may be able to provide billing-quality hourly-interval customer AMI usage data to CRES providers *via* EDI for AMI meters that have been processed through VEE. The interval customer usage AMI data would be in hourly intervals and would be updated monthly after each account bills. All hourly-interval customer usage AMI data available via EDI would be billing quality, pursuant to the previously mentioned Stipulation and Recommendation in Case No. 11-3549-EL-SSO. It is anticipated that this project will be discussed further in the Duke Energy Ohio SmartGrid Collaborative and submitted to the Commission for approval as appropriate. At present, the Company is only aware of one CRES provider that is interested in time-of-use rates.

Q. WHAT IS REQUIRED TO HAVE BILLING-QUALITY HOURLY-INTERVAL CUSTOMER USAGE DATA FOR ALL AMI METERS?

A. In order to provide billing-quality hourly-interval customer usage data to CRES providers for all AMI meters, it would be necessary to migrate data from the first generation MDM System to the second generation MDM System, which has scalable VEE functionality for hourly-interval customer usage AMI data.

An MDM System migration would migrate all Duke Energy Ohio AMI meter data from Duke Energy Ohio's first generation MDM System, which does not have scalable VEE functionality for hourly-interval usage data, to its second generation MDM System, which does have scalable VEE functionality for hourly-interval data. If stakeholders require this functionality, and the Commission determines that it is of value to customers, Duke Energy Ohio would have billing-quality hourly-interval customer usage data for all AMI meters. Additional Duke Energy Ohio projects may then be required to provide hourly-interval customer usage data to CRES providers via EDI and the CRES Portal for these migrated AMI meters.

As with the EDI enhancements, a decision to go forward with this project will be discussed internally and with external stakeholders and presented to the Commission when appropriate.

IV. DIRECT ENERGY WITNESS TESTIMONY

Q. DIRECT ENERGY WITNESS JENNIFER L. LAUSE STATES THAT THE COMMISSION SHOULD ORDER DUKE TO IMPLEMENT PRIORITY PHASE ONE WITHIN NINE MONTHS OF THE OPINION AND ORDER IN THIS CASE. DOES DUKE ENERGY OHIO HAVE PLANS TO DELIVER ALL THE PRIORITY PHASE ONE PROPOSALS REQUESTED BY DIRECT ENERGY?

A. No, Duke Energy Ohio currently only has plans to deliver functionalities outlined as the CRES Portal enhancements of June 1, 2014.

Q. DIRECT ENERGY WITNESS JENNIFER L. LAUSE STATES THAT THE COMMISSION SHOULD ORDER DUKE ENERGY OHIO TO IMPLEMENT PRIORITY PHASE TWO AND THREE CAPABILITIES, WITH PRIORITY

PHASE THREE TO BE IN PLACE NO LATER THAN JUNE, 2018. DOES DUKE ENERGY OHIO HAVE PLANS TO DELIVER ALL THE PRIORITY PHASE TWO AND THREE PROPOSALS?

A. No, Duke Energy Ohio currently only has plans to deliver functionalities outlined as the CRES Portal enhancements of June 1, 2014. Also, even if a project to migrate MDM System data and enhance EDI proceeds, Duke Energy Ohio does not plan to make data available with intervals shorter than hourly, reporting more frequently than monthly after billing, or to push data to suppliers upon demand.

Q. IN TESTIMONY, DIRECT ENERGY WINTESS TERESA L. RINGENBACH STATES THAT THE COMMISSION SHOULD REQUIRE DUKE ENERGY OHIO TO IMPLEMENT AND 'GO LIVE' WITH A FLAT FILE TRANSFER SITE WITHIN SIX MONTHS OF THE COMMISSION'S INITIAL ORDER IN THIS CASE. DOES DUKE ENERGY OHIO HAVE PLANS TO IMPLEMENT SUCH A FUNCTIONALITY?

A. Yes, as of June 1, 2014, CRES providers will be able to export hourly-interval customer usage AMI data from the CRES Portal in flat file format on a meter-by-meter basis.

Q. DIRECT ENERGY WITNESS TERESA L. RINGENBACH STATES THAT COSTS ASSOCIATED WITH DUKE ENERGY OHIO'S EDI ENHANCEMENTS SHOULD BE INCLUDED IN THE RIDER. HAS DUKE ENERGY OHIO INCLUDED ANY COSTS ASSOCIATED WITH THE EDI ENHANCEMENTS IN THE RIDER FILING FOR THIS CASE?

A. No, the EDI enhancements were not implemented in 2012, and therefore could not be included in the rider adjustments for recovery of 2012 SmartGrid costs.

V. CONCLUSION

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

A. Yes.

Duke Energy Ohio
Case No. 17-1263-EL-SSO
OCC Fourth Set Interrogatories
Date Received: August 31, 2017

OCC-INT-04-283

REQUEST:

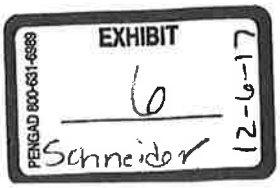
Referring to the testimony of Mr. Schneider at page 6:

a. Please explain how gas usage information is collected and recorded from meters on a monthly basis for billing purposes in both the Node and Mesh AMI metering environment.
b. How frequently are customer gas meter reads performed?
c. What is the estimated cost per meter per month to obtain natural gas usage meter reads in the Node AMI Metering Environment? Please provide all supporting data, assumptions, methodologies, projections, and calculations for such estimate.
d. What is the estimated cost per meter per month to obtain natural gas usage meter reads in the Mesh AMI Metering Environment? Please provide all supporting data, assumptions, methodologies, projections, and calculations for such estimate.
e. What was the cost per meter per month to obtain natural gas usage meter reads on a manual basis before Duke's smart grid deployment? Please provide all supporting data, assumptions, methodologies, projections, and calculations.
f. Did Duke consider Automated Meter Reading (AMR) as an option to obtain monthly gas meter reads as opposed to upgrading the node AMI environment, and if so, please list the reasons why this alternative is not being pursued?

RESPONSE:

Referring to Mr. Schneider's testimony describing Duke Energy Ohio's overall AMI network architecture at page 6:

a. In the node environment, gas usage information is recorded by a gas AMI module, sent to its node, and collected from node. In mesh environment, gas usage information is recorded by a gas AMI module, sent to its paired electric meter, and collected from electric meter.
b. Gas AMI modules perform meter reads on a daily basis.
c. Duke Energy Ohio has not estimated the cost per meter per month to obtain natural gas usage meter reads. However, the Gas Costs Only section of OCC-INT-02-009(a) shows that the total ongoing Monthly Cellular Costs would be higher under the Continue Node Environment scenario than the Transition to Mesh Environment scenario. Those Monthly Cellular Costs reflect the costs to



transmit usage data from meters to the company for monthly billing, rather than getting the usage data through manual meter reading.

d. See response to OCC-INT-08-169(c).
e. The Company does not have any data on the cost per meter per month to obtain gas usage meter reads on an annual basis.
f. Duke Energy does not agree with the assumption that AMR for gas customers is an alternative to upgrading the entire AMI environment. Notwithstanding the objection, changing gas AMI modules to gas AMR modules would create new meter reading costs to be borne exclusively by gas customers due to reduced efficiencies of a shared AMI solution.

PERSON RESPONSIBLE: Donald L. Schneider

Duke Energy Ohio
Case No. 17-0032-EL-AIR
OCC Ninth Set of Interrogatories
Date Received: August 15, 2017

OCC-INT-09-190

REQUEST:

Referring to the Duke response to OCC-INT-08-169:

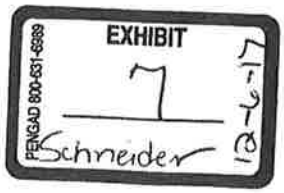
a. Quantify the impact of the "new meter reading costs" that would be borne by gas customers if an AMR solution was pursued for obtaining gas meter reads?
b. Why does Duke collect gas meter reads on a daily basis?

RESPONSE:

a. Duke Energy Ohio has not quantified the impact of meter reading costs if its gas customers were transitioned from AMI to AMR.
b. Gas meter reads are collected daily for a variety of reasons, including but not limited to: early detection of zero usage or usage on an inactive account, ability to provide daily usage information to customers via the Duke Energy customer portal, and the ability to offer certain Enhanced Basic Services for dual service customers.

PERSON RESPONSIBLE:

Donald L. Schneider, Jr.



Duke Energy Ohio
Case No. 17-1263-EL-SSO
OCC Fourth Set Interrogatories
Date Received: August 31, 2017

OCC-INT-04-202

REQUEST:

Referring to Mr. Schneider's testimony, page 9, which describes a "business continuity effort" that Duke has begun to deal with Ambient Communications node failures.

a. Please quantify capital and operating costs associated with this effort included in the rate case test year.
b. Please quantify the projected capital and operating costs associated with this effort in 2017 and 2018.
c. If capital and operating costs associated with this effort are included in the rate case test year, please identify with specificity the testimony, exhibits, attachments, work-papers, or other rate case filing documents in which this test year spending can be located.
d. Please describe the basis for Duke's decision to deploy Itron meters and associated meter data management system for residential customers. In your response please disclose when and why Itron meters and associated meter data management system and communication system were first installed for residential customers.
e. Please quantify the costs of the business continuity effort to transition from a node AMI environment to a mesh environment for residential customers to date.
f. Please explain how the costs of the business continuity effort in transitioning from a node AMI environment to a mesh communications environment for residential customers have been recovered to date.

RESPONSE:

a. Capital costs associated with the business continuity effort were not incurred until after June 2016; consequently, capital costs are not included in the rate case test year. There were no O&M costs associated with the business continuity effort during the rate case test year either.

b. See table below:

c.

	Total	2017	2018
Capital	24,136,045	10,081,979	14,054,066
O&M	60,506	60,506	0
Total	**24,196,551**	**10,142,485**	**14,054,066**

response to OCC-INT-04-202(a).

d. Objection. The interrogatory is susceptible to differing interpretations and thus Duke Energy Ohio would have to engage in speculation and guesswork to ascertain the intended meaning of this Interrogatory. Without waiving said objection, to the extent discoverable, and in the spirit of discovery, referring to the business continuity effort, the basis for Duke Energy Ohio's decision to deploy Itron meters and associated meter data management system for residential customers as part of its business continuity effort was already explained in testimony.

e. See table below for actual costs through July 31, 2017:

	2017
Capital	3,102,258
O&M	2,404
Total	**3,104,662**

f. To the best of my knowledge, the costs of the business continuity effort have not been recovered to date. These projects are not in-service on the books as of today.

PERSON RESPONSIBLE: Donald L. Schneider, Jr.

Duke Energy Ohio
Case No. 17-1263-EL-SSO
OCC Sixth Set Interrogatories
Date Received: October 11, 2017

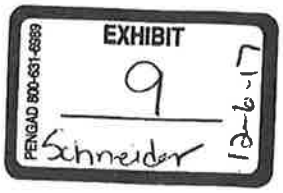
OCC-INT-06-295

REQUEST:

Referring to the Direct Testimony of Donald L. Schneider, Jr. at page 9-10:

a. What is the total projected cost for the business continuity effort for the years 2017 and 2018?
b. What are the total projected costs associated with removal of the approximate 23,700 communication nodes?
c. What is the total number of Connected Grid Routers that are being purchased as part of the business continuity effort in 2018 and 2019?
d. What is the projected cost associated with purchasing the additional Connected Grid Routers?
e. When the inventory for the communication nodes is back at the desired stocking level, how long does Duke anticipate being able to continue operating the node AMI environment?
f. What are the total projected capital costs in 2017 and 2018 associated with purchasing the Itron electric meters that will replace approximately 80,000 Echelon electric meters?
g. How many Echelon meters does Duke currently have on-hand for replacing failed meters?
h. What does Duke intend to do with the 80,000 Echelon meters and 48,800 Badger gas communication modules that are being replaced as part of the business continuity effort in 2018 and 2019?
i. What are the total projected capital costs in 2017 and 2018 associated with purchasing the Itron gas communication modules that will replace the 48,800 Badger gas communication modules?
j. How does the Company intend to recover the capital costs associated with the business continuity effort 2017 and 2018?
k. How does the Company intend to recover O&M costs associated with the business continuity effort in 2017 and 2018?

RESPONSE:



a. See table below:

	Total	2017	2018
Capital	$24,136,045	$10,081,979	$14,054,066
O&M	60,506	60,506	0
Total	**$24,196,551**	**$10,142,485**	**$14,054,066**

b. See response to OCC-INT-06-295(a) which includes the node removal costs.

c. 144.

d. See table below:

	Total	2017	2018
Connected Grid Routers	$ 660,158	$256,728	$403,430

e. After the business continuity efforts are complete by the end of 2018, Duke Energy Ohio will need to undertake additional efforts to replenish node inventory in 2019 if the AMI Transition does not proceed as proposed.

f. See table below:

	Total	2017	2018
Itron Meters	$10,111,082	$4,266,984	$5,844,099

g. Duke Energy Ohio had 499 Echelon meters as of 10/2/17 with a desired inventory level of around 500 meters. Approximately 250 Echelon meters are installed each month. Some Echelon meters removed for the Ohio business continuity effort are sent to Queensgate for refurbishment to supply the field needs.

h. A portion of the Echelon meters are being sent to Queensgate for refurbishment to support field needs, with the remainder being scrapped. All gas modules are being scrapped.

i. See table below:

	Total	2017	2018
Itron Gas Modules	$2,949,511	$1,249,254	$1,700,257

j. If the capital costs related to electric are included in FERC accounts 360-374 they will be included in Rider DCI. Capital costs that are included in FERC accounts 301-303 and 380-398 will also be included in Rider DCI if the Company's request in this case to include distribution-related intangible and general plant in Rider DCI is approved. If this request to expand the plant

accounts eligible for Rider DCI is not approved there will be no recovery on general and intangible plant until the Company's next base electric case. At this time, the Company has not requested recovery for any of the capital costs related to gas.

k. O&M costs not included in the Company's test period in the pending electric base distribution rate case will not be recovered by customers unless the Company has another base electric or gas rate case in calendar year 2018, or potentially in the proposed PowerForward Rider.

PERSON RESPONSIBLE: Parts a-i: Donald L. Schneider, Jr.;
Parts j-k: William Don Wathen Jr.

Duke Energy Ohio
Case No. 17-0032-EL-AIR
OCC Second Set of Interrogatories
Date Received: April 12, 2017

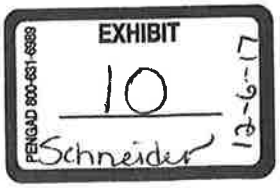
OCC-INT-02-036

REQUEST:

Referring to Mr. Nicholson's testimony at page 7, lines 15-16, in your statement that, "EDMS does not have scalable VEE functionality for internal AMI CEUD," please explain whether Duke was aware of this lack of functionality at the time of the purchase of this system.

RESPONSE:
Objection. This Interrogatory is vague, ambiguous, and unduly burdensome. The question is susceptible to different interpretations and Duke Energy Ohio would have to engage in speculation or conjecture to ascertain the intended meaning of this request.
Objecting further, this Interrogatory is overly broad and unduly burdensome, given that it seeks information that is unlimited as to time and that is neither relevant to this proceeding nor likely to lead to the discovery of admissible evidence in this proceeding.
Objecting further, this Interrogatory seeks to elicit information that is of public record and thus is equally accessible to the Office of the Consumers' Counsel. Without waiving said objection, to the extent discoverable, and in the spirit of discovery, at the time of purchase, Duke Energy Ohio was aware that EDMS did have VEE functionality for interval AMI CEUD in a scalable manner. Duke Energy Ohio found that the cost and long-term support of that functionality was not optimal.

PERSON RESPONSIBLE: As to Objection - Legal
As to Response - Donald Schneider, Jr.



FILE

Duke Energy

8

Duke Energy Corporation
139 East Fourth Street
P.O. Box 960
Cincinnati, Ohio 45201-0960

June 25, 2010

The Public Utilities Commission of Ohio
Attention: Docketing Division
180 East Broad Street
13th Floor
Columbus, OH 43215-3793

RE:	In the Matter of The Application of	)	
	Duke Energy Ohio, Inc. for Tariff	)	Case No. 10-455-EL-ATA
	Approval for Rate PTR	)	

Docketing Division:

Enclosed for filing in compliance with the Commission's Order dated June 23, 2010 in the above referenced case are four (4) copies of new Rider PTR, Peak Time Rebate – Residential Pilot Program. Also attached is an updated Index.

One copy of the enclosed tariff is for filing with TRF Docket Number 89-6002-EL-TRF.

Please time-stamp the enclosed extra copy and return for our file. Thank you.

Very truly yours,

Jim Ziolkowski

Jim Ziolkowski
Rates Manager

Enclosures

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Filed pursuant to an Order dated December 17, 2008 in Case No. 08-920-EL-SSO, and an Order dated June 23, 2010 in Case No. 10-455-EL-ATA before the Public Utilities Commission of Ohio.

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Filed pursuant to an Order dated December 17, 2008 in Case No. 08-920-EL-SSO, and an Order dated June 23, 2010 in Case No. 10-455-EL-ATA before the Public Utilities Commission of Ohio.

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Filed pursuant to an Order dated December 17, 2008 in Case No. 08-920-EL-SSO, and an Order dated June 23, 2010 in Case No. 10-455-EL-ATA before the Public Utilities Commission of Ohio.

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Filed pursuant to an Order dated December 17, 2008 in Case No. 08-920-EL-SSO, and an Order dated June 23, 2010 in Case No. 10-455-EL-ATA before the Public Utilities Commission of Ohio.

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RIDER PTR

PEAK TIME REBATE – RESIDENTIAL PILOT PROGRAM

AVAILABILITY

The Peak Time Rebate (PTR) Program is applicable to residential Customers served under Rates RS and TD-AM. This rider is available only as Company advanced meters with interval recording registers are installed on the customer's premises. The advanced meters must be commissioned, certified, and provide billable quality data. This rider is available to the first five hundred (500) customers that request service under this rider. Eligible customers must receive generation service from Duke Energy Ohio. This rider is not available to customers on income payment plans, budget billing, HEAP, or any other assistance plan. Customers participating in the Power Manager program are not eligible to participate in the PTR Program.

Rider PTR is offered on a pilot basis. The Company reserves the right to modify this rider, subject to approval by the Commission, as information regarding customer participation, load response, costs, and other pertinent information becomes available.

PROGRAM DESCRIPTION

The PTR Program is voluntary and offers residential Customers the opportunity to reduce their electric costs by reducing their electric usage during Company's critical peak load periods (critical peak events).

At its discretion, the Company may call up to ten (10) critical peak periods per year during the calendar months of June, July, August, and September. Participating customers will be notified on the day prior to a critical peak event of the planned event for the next day. Critical peak events will last 8 hours and will begin at noon and end at 8 P.M., and they will not occur on weekends or holidays as recognized by the National Electric Reliability Corporation (NERC). The Company may call up to three (3) events per week with no more than two (2) events occurring on consecutive days. A week is defined as the period Sunday through Saturday.

Participating customers may choose to maintain their electric usage levels at previous levels during an event. Customers who do not reduce usage levels during the event will not incur any penalties, and they will be billed for the electricity consumed during the event at the normal tariff rates. No customer's bill will increase as a result of this tariff.

Customers will receive a bill credit of $0.2800 per kWh of load reduction during the critical peak event. Credits will appear on participating customers' bills. The kWh load reduction is calculated as the difference between the estimated kWh usage that would have occurred during the critical peak event without action by the participant (estimated kWh) and the participant's actual kWh usage during the critical peak event (actual kWh). Credits will be computed and provided on customers' bills within two monthly billing cycles. Bills ordinarily are rendered at monthly intervals. The word "month" shall mean the period of approximately thirty (30) days between monthly bill dates.

Issued pursuant to an Order dated June 23, 2010 in Case No. 10-455-EL-ATA before the Public Utilities Commission of Ohio.

PROGRAM DESCRIPTION (CONTINUED)

The Company will use the participant's recent historical electricity consumption information for non-event, non-holiday weekdays in establishing the participants' individualized estimated kWh usage for use as a base line to determine the amount of load reduction.

BILLING UNDER STANDARD RATES

Customers served under Rate RS or Rate TD-AM will be billed for all energy used under the terms and conditions and at the rates and charges of the applicable tariff. In addition, Customers will receive credits on their electric bill for participation in the PTR Program as described above in the PROGRAM DESCRIPTION section.

CUSTOMER NOTIFICATION OF CRITICAL PEAK EVENTS

Participating customers will be notified by 8:00 P.M. on the day prior to a critical peak event of the planned event for the next day. The Company will notify customers of critical peak events for the following day via telephone, e-mail, text messaging, or any other means that becomes available. The customer will be required to provide a primary contact method of communication.

Participating customers are responsible for the costs of establishing and maintaining internet service, e-mail service, telephone service, and/or cell phone text messaging service. The Company will provide a mechanism for participants to choose their primary preferred communication channel.

The Company is not liable for any damages or claims resulting from customers' failure to receive notice of a critical peak event, for any reason.

TERM AND CONDITIONS

Except as provided in this Rider PTR, all terms, conditions, rates, and charges outlined in the applicable Rate RS or Rate TD-AM will apply. Participation in the PTR Program will not affect Customers' obligations for electric service under these rates.

Any interruptions or reductions in electric service caused by outages of Company's facilities, other than as provided under the PTR Program, will not be deemed an event period under this PTR Program. Agreements under the PTR Program will in no way affect Customer's or Company's respective obligations regarding the rendering of and payment for electric service under the applicable electric tariff and its applicable rate schedules. It will be Customer's responsibility to monitor and control their demand and energy usage before, during, and after a critical peak event period.

The supplying and billing for service and all conditions applying thereto, are subject to the jurisdiction of the Public Utilities Commission of Ohio, and to the Company's Service Regulations currently in effect, as filed with the Public Utilities Commission of Ohio.

Duke Energy Ohio
Case No. 17-0032-EL-AIR
OCC Eighth Set of Interrogatories
Date Received: June 30, 2017

OCC-INT-08-174

REQUEST:

Please explain the rationale that Duke used in developing the communications requirements related to the number of AMI meters that can deliver usage data simultaneously in near real-time every 15 minutes.

RESPONSE:

When choosing an AMI solution, Duke Energy did not have requirements for collecting usage data "real-time".

PERSON RESPONSIBLE: Don Schneider

FILE

23

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc. to Adjust and Set Its Gas and Electric Recovery Rate for 2010 SmartGrid Costs Under Riders AU and Rider DR-IM and Mid-deployment Review of AMI/SmartGrid Program.	))))))	Case No. 10-2326-GE-RDR

STIPULATION AND RECOMMENDATION

Ohio Administrative Code (O.A.C.), Section 4901-1-30, provides that any two or more parties to a proceeding before the Public Utilities Commission of Ohio (Commission) may enter into a written stipulation covering the issues presented in that proceeding. This Stipulation and Recommendation (Stipulation) sets forth the understanding of Duke Energy Ohio, Inc. (Duke Energy Ohio or the Company), the Office of the Ohio Consumers' Counsel (OCC), the Commission Staff (Staff),[1] Ohio Partners for Affordable Energy (OPAE), Direct Energy Services, LLC, and Direct Energy Business Services, LLC (each of whom is a Signatory Party, and together constitute the Signatory Parties or Parties). The Signatory Parties recommend that the Commission approve and adopt, as part of its Opinion and Order, this Stipulation that resolves all of the issues in the above-captioned proceeding.

This Stipulation is a product of lengthy, serious, arm's-length bargaining among the Signatory Parties, who are all capable, knowledgeable parties, which negotiations were undertaken by the Signatory Parties to settle this proceeding and is not intended to reflect the views or proposals that any individual party may have advanced acting unilaterally. This

[1] The Staff of the Public Utilities Commission of Ohio will be considered a party for the purpose of entering into this Stipulation pursuant to Ohio Administrative Code Sections 4901-1-10(C) and 4901-1-30.

Stipulation was negotiated among all parties to the proceeding. The Signatory Parties agree that this Stipulation is in the best interests of the public, and urge the Commission to adopt it.

This Stipulation is supported by adequate data and information. As a package, the Stipulation benefits customers and the public interest; represents a reasonable resolution of all issues in this proceeding, violates no regulatory principle or practice, and complies with and promotes the policies and requirements of Ohio Revised Code Chapter 4928. While this Stipulation is not binding on the Commission, it is entitled to careful consideration by the Commission, where, as here, it is sponsored by parties representing a wide range of interests.

Except for purposes of enforcement of the terms of this Stipulation, this Stipulation, the information and data contained therein or attached, and any Commission rulings adopting it, shall not be cited as precedent in any future proceeding for or against any Signatory Party or the Commission itself. The circumstances of this case are unique to it, and thus imputing the terms of this Stipulation into any other case undermines the willingness of the parties to compromise that is a necessary element of negotiating settlements in Commission proceedings. The Signatory Parties' agreement to this Stipulation, in its entirety, shall not be interpreted in a future proceeding before this Commission as their agreement to only an isolated provision of this Stipulation, or to any position, argument or recommendation contained in the record of this proceeding or otherwise presented in this proceeding. More specifically, no specific element or item contained in or supporting this Stipulation shall be construed or applied to attribute the results set forth in this Stipulation as the results that any Signatory Party might support or seek, but for this Stipulation in these proceedings or in any other proceeding. The Stipulation is a recognition that each Signatory Party disagrees with individual aspects of the Stipulation, but believes that the Stipulation has value as a whole. This Stipulation is a reasonable compromise

involving a balancing of competing positions and it does not necessarily reflect the position that one or more of the Signatory Parties would have taken if these issues had been fully litigated.

This Stipulation is expressly conditioned upon its adoption by the Commission in its entirety and without material modification. If the Commission rejects or materially modifies all or any part of this Stipulation,[2] each and every Signatory Party shall have the right, within thirty days of issuance of the Commission's Order, to file an application for rehearing or to terminate and withdraw the Stipulation by filing a notice with the Commission. The Signatory Parties agree they will not oppose or argue against any other Signatory Party's notice of termination or application for rehearing that seeks to uphold the original, unmodified Stipulation. If, upon rehearing, the Commission does not adopt the Stipulation in its entirety and without material modification, any Signatory Party may terminate and withdraw from the Stipulation. Termination and withdrawal from the Stipulation shall be accomplished by filing a notice with the Commission, including service to all Signatory Parties in this proceeding, within thirty days of the Commission's Order or ruling on rehearing that does not adopt the Stipulation in its entirety and without material modification. Other Signatory Parties to this Stipulation agree to not oppose the termination and withdrawal of the Stipulation by any other Signatory Party. Upon the filing of a notice of termination and withdrawal, the Stipulation shall immediately become null and void.

Prior to the filing of such a notice, the Signatory Party wishing to terminate agrees to work in good faith with the other Signatory Parties to achieve an outcome that substantially satisfies the intent of the Stipulation and, if a new agreement is reached that includes the Signatory Party wishing to terminate, then the new agreement shall be filed for Commission

[2] Any Signatory Party has the right, at its sole discretion, to determine what constitutes a "material" change for the purposes of that Party withdrawing from the Stipulation.

review and approval. If the discussions to achieve an outcome that substantially satisfies the intent of the Stipulation are unsuccessful in reaching a new agreement that includes all Signatory Parties to the present Stipulation, the Commission will convene an evidentiary hearing such that the Signatory Parties will be afforded the opportunity to present evidence through witnesses and cross-examination, present rebuttal testimony, and brief all issues that the Commission shall decide based upon the record and briefs as if this Stipulation had never been executed.

WHEREAS, in its first Electric Security Plan (ESP) proceeding, Case Nos. 08-920-EL-SSO, *et al.*, Duke Energy Ohio agreed to deploy a SmartGrid program for electric and gas customers; and

WHEREAS, in its first ESP proceeding, Duke Energy Ohio agreed that as part of the annual due process related to 2010 costs net of benefits, the Company would include a mid-deployment program summary and review with the second quarter 2011 filing, outlining its progress in deploying the SmartGrid program through 2010; and

WHEREAS, this case involves the mid-deployment review of the Company's progress in deploying the SmartGrid program; and

WHEREAS, this Stipulation represents a serious compromise of complex issues and involves substantial benefits that would not otherwise have been achievable; and

WHEREAS, the Signatory Parties believe that the agreements herein represent a fair and reasonable solution to the issues raised in the case set forth above concerning Duke Energy Ohio's Application,

THEREFORE, it is agreed that:

I. FINANCIAL AND ACCOUNTING

a. The Signatory Parties agree that Duke Energy Ohio shall receive a revenue increase applicable to Rider DR-IM of $19.2 million, and a revenue increase of $9.8 million applicable to Rider AU.[3] These revenue increases result in rates of $2.24 per meter per month for residential electric customers and $3.31 per meter per month for non-residential electric customers under Rider DR-IM. The revenue increase results in a rate of $1.97 per meter per month under Rider AU. Gas only customers will receive a $0.92 credit per meter per month.

b. The Signatory Parties recognize and agree that the monthly charge per residential electric meter resulting from the Rider DR-IM revenue requirement for the applicable period is below the applicable cap established in the Stipulation and Recommendation approved by the Commission in Case No. 08-920-EL-SSO, *et al.*

c. The Signatory Parties further agree that the revenue requirements are based upon a cost of capital consistent with the latest approved cost of capital (from Case No. 08-709-EL-AIR and Case No. 07-589-GA-AIR).

II. NETTING OF BENEFITS AGAINST COSTS

a. The Signatory Parties agree that Duke Energy Ohio shall reduce its revenue requirement by an amount equal to the value of operational benefits, as set forth by MetaVu in its Smart Grid Audit and Assessment Report (MetaVu Report) levelized over four years as provided in paragraph b. below. The electric share of the 2010 benefits to be netted against 2010 costs for purposes of revenue recovery is $1,048,000.

[3] The Signatory Parties are not agreeing to any particular expense item in Duke Energy Ohio's Application.

b. Duke Energy Ohio commits to maintain Rider DR-IM as the means to recover SmartGrid investment through the year in which full deployment occurs.[4] Beginning with the next Rider DR-IM filing, which will recover the electric share of SmartGrid costs incurred through December 31, 2011, and for each Rider DR-IM filing for the following three years, the Company agrees to include the electric distribution share of operational savings derived from the MetaVu Report. The total savings from the MetaVu Report for the respective years are as follows:

Savings to include in 2011 revenue requirement:	$2.38 million
Savings to include in 2012 revenue requirement:	$4.77 million
Savings to include in 2013 revenue requirement:	$8.00 million
Savings to include in 2014 revenue requirement:	$10.67 million

c. In order to mitigate the impact of the rate increases attributable to Rider DR-IM, the Company agrees to defer recovery of all or a portion of the following expenses normally recovered in the Rider DR-IM revenue requirement for 2011 and 2012 (O&M, depreciation, and/or property taxes). Such deferrals are incremental to the normal deferral process used in the Rider DR-IM calculations and are calculated as per Attachment 1. The amount of the incremental deferrals attributable to costs incurred in 2011 and 2012 will be $3.86 million and $1.47 million, respectively. Duke Energy Ohio shall be allowed to increase the revenue requirement of Rider DR-IM for costs incurred in 2013 and 2014 to recover the expenses deferred from the 2011 and 2012 recovery periods. The additional

[4] Full deployment shall mean that all SmartGrid hardware and systems necessary to generate the benefits set forth in Attachment 2, Column 2015. The point in time when full deployment occurs or has been achieved shall be determined by the Staff of the Commission based upon information provided by the Company.

recovery in 2013 and 2014 will be $1.76 million and $4.43 million, respectively. The impact on the Rider DR-IM revenue requirement will be as follows:

DR-IM for 2011	$3.86 million reduction in revenue requirement
DR-IM for 2012	$1.47 million reduction in revenue requirement
DR-IM for 2013	$1.76 million increase in revenue requirement
DR-IM for 2014	$4.43 million increase in revenue requirement

d. The Company commits to filing an electric distribution rate case in the first year after full deployment of SmartGrid as defined herein. The rate case will include the SmartGrid investment and adjusted operating expenses. The test year used in the base rate application shall begin no earlier than the date of full deployment such that the revenue requirement requested in that case will reflect the level of the benefits attributable to SmartGrid which have actually been achieved by the Company and all prudently incurred current costs associated with the program. If full deployment does not occur by the end of 2014, the Company will continue filing Rider DR-IM for each year until full deployment occurs and will net against costs in the Rider DR-IM revenue requirement for 2015 the electric distribution share of savings of $12.933 million. Insofar as 2015 represents the projected full deployment date and the estimated benefits for that year should approximate steady state savings, the Company will continue to include the electric distribution share of savings of $12.933 million in the Rider DR-IM revenue requirement for as long as it continues.

e. For any electric distribution rate case filed subsequent to full deployment, and which includes a test year that falls after full deployment, such that the revenue

requirement requested in that case will reflect actual level of benefits attributable to SmartGrid achieved to date, the Signatory Parties agree there will no longer be a need to account for costs and benefits outside of the base rate setting mechanism.

f. The Signatory Parties agree that costs and savings attributable to SmartGrid flowed through Rider DR-IM will not also be flowed through electric distribution base rates if new base rates are established before full deployment; consequently, Duke Energy Ohio may adjust test year O&M expenses for the test year being used for the rate case, as appropriate to ensure that the costs and savings attributable to SmartGrid during the test year are not counted twice.

g. With regard to gas SmartGrid, the 2011 annual revenue requirement for Rider AU will reflect $1.041 million in savings (as allocated to gas distribution per Attachment 1).

h. If the Company files for new gas distribution rates before full deployment, the revenue requirement for gas distribution rates will include (1) all prudently incurred SmartGrid costs allocable to gas and (2) a guaranteed level of savings, which will be at the level established in Attachment 1[5] net of gas SmartGrid savings that are already included in the test year. For example, if the next rate case uses 2012 as a test year for revenue requirements, the guaranteed level of savings will be $2.026 million. If the next rate case uses 2013 as a test year, the guaranteed level of savings to be incorporated into base rates will be $3.409 million and the 2012 Rider AU will include $2.026 million in savings. And, if the

[5] It may be necessary to pro rate the savings between years if the rate case is filed using a test year that is not a calendar year.

next rate case uses 2014 as a test year, the guaranteed level of savings will be $4.544 million in base rates and the Rider AU filings for 2012 and 2013 will include a guaranteed level of savings of $2.026 million for 2012, and $3.409 million for 2013. Moreover, if the Company files an application for authority to implement a capital expenditure program pursuant to sections 4909.18, and 4929.111, Revised Code, that includes SmartGrid investment, the savings mentioned in paragraph g. above will be used as an offset for the appropriate time.

i. The Signatory Parties agree that they will not consider the deferred cost recovery described in paragraph (c) above to be included for purposes of determining whether the Rider DR-IM rates for recovery of 2013 and 2014 electric SmartGrid costs are above the caps the Signatory Parties agreed to in the Stipulation and Recommendation in Case Nos. 08-920-EL-SSO, *et al.*

j. For at least one year beyond full deployment, the Company will separately track SmartGrid non-cost metrics for electric Rider DR-IM. The Company will provide annual reports to the Commission and to the Signatory Parties that detail progress in achieving completion of non-cost metrics related to operational benefits as set forth in Attachment 2.

k. In light of the Signatory Parties' agreement that the Company will provide annual reports to the Commission detailing its progress with respect to the non-cost metrics set forth in Attachment 2, and further, because the Company has agreed to reduce its revenue requirement by the full value of operational benefits as set forth in Attachment 2, including the bringing forward of value so that customers receive such value sooner, the Signatory Parties agree that there will be no dispute

in the agreed upon number for netting of benefits in any succeeding Rider DR-IM or Rider AU proceeding.

l. The Signatory Parties agree that the Company is entitled to full recovery of an annual revenue requirement that is approved by the Commission (subject to any appeals) related to SmartGrid independent of the timing of any base rate case.[6] The Signatory Parties further agree that recovery of SmartGrid revenue requirements should only be via the SmartGrid Riders (DR-IM and AU) *or* through base rates but should not be recovered through both mechanisms contemporaneously even if the recovery is for revenue requirements associated with different periods. The Signatory Parties agree that an adjustment to revenue requirements (via deferrals, regulatory asset creation, and regulatory asset amortization) for a base rate case may be necessary to ensure that the SmartGrid riders are not being collected at a time when any SmartGrid costs for any period are being collected in base rates.

III. CUSTOMER PILOTS AND TIME DIFFERENTIATED RATES

a. Duke Energy Ohio will continue to work with the Duke Energy Ohio SmartGrid Collaborative in developing a portfolio of time-differentiated rate offerings[7] that include further pilot programs of innovative designs and non-pilot rates that

[6] The Signatory Parties expressly reserve the right to challenge recovery of costs in each Rider proceeding and in any rate case proceeding as imprudent, so long as any such challenge is not inconsistent with the terms of this Stipulation.

[7] For purposes of this Stipulation, time differentiated rates are rates that include different electricity prices for different times of the day, week, or year. Time differentiated rates also include rates that respond as predetermined by the Company to electricity market events.

provide standard service offer customers pricing structures that incentivize them to shift energy usage to reduce their electric bills.

b. Duke Energy Ohio will conduct an educational workshop for all interested parties and specifically interested competitive retail electric service (CRES) providers wherein the Company will provide and share its insights and learning related to the Company's two years of experience offering time differentiated rates. The Company will continue to conduct workshops for CRES providers and interested parties twice a year during the course of SmartGrid deployment so long as there is interest in doing so. The first educational workshop shall take place at the Commission offices on or before November 1, 2012.

c. The Company will provide CRES providers the necessary billing system functionality to offer CRES customers time differentiated rates consistent with its existing supplier tariff beginning January 1, 2013. Duke Energy Ohio shall provide a quarterly update to the Collaborative on the status of implementing the necessary billing functionality.

d. During 2012, the Company shall work with the Collaborative to develop a deployment plan for a general public awareness and an education campaign designed to increase customer awareness and inform customers about the justification for time differentiated rates and the value that they can potentially bring to customers. After vetting the campaign and gaining Collaborative approval for the plan, the Company shall begin its campaign in calendar year 2013 consistent with the plan. The Company shall file the Collaborative-approved plan for the campaign in its filing in the 2012 Rider DR-IM filing to be

made with the Commission in the spring of 2013. The actual costs incurred consistent with the Collaborative's approved plan for the general awareness campaign shall be recovered by the Company beginning in 2014 through Rider DR-IM. This provision in no way affects the rights of individual Collaborative members to challenge the Company's collection of costs associated with the campaign through Rider DR-IM.

e. Duke Energy Ohio agrees, through the end of 2015: (a) not to use prepaid metering; (b) not to require mandatory non-pilot time-of-use rates, and (c) not to seek a waiver from Rule 4901:1-18-05(A), O.A.C., regarding personal or written notice, prior to using any remote disconnection capabilities for non-payment (but once properly noticed, the Company may still use remote disconnect functionality).

f. If approved in the Company's Energy Efficiency Portfolio (Case No. 11-4393-EL-POR), Duke Energy Ohio will offer an incentive to participating customers toward the installation of a Home Energy Management device that will not only provide customers enhanced information to optimize bill savings through energy efficiency, but also to potentially enhance the attractiveness of time differentiated rates. Customers will not be required to purchase a specific Home Energy Management device or to purchase a device from a specific vendor to participate in the new rates.

IV. CYBER SECURITY

a. Duke Energy Ohio recognizes and acknowledges its responsibility for managing cyber security risks and will leverage applicable elements contained in *Guidelines*

for Smart Grid Cyber Security National Institute of Standards and Technology, Interagency Reports (NISTIR) 7628, volumes 1 and 3, and successor volumes and/or standards, practices or guidelines that evolve from such volumes. In 2012, as Duke Energy IT Security performs its risk assessment and mitigation strategy as part of the SmartGrid cyber plan, the NISTIR 7628 will be used as the basis of that assessment.

b. In 2012, the Risk Assessment (RA) and mitigation strategy will include the security requirements identified on page 62 of the Duke Energy Ohio MetaVu Report as having a high potential of a security breach, and for which there is no conformity. The RA and mitigation strategy in subsequent years should include those security requirements to the extent the associated risks have not been mitigated. The strategy will also address relevant elements of the NISTIR that apply to new SmartGrid technology developments and deployments that have not been subject to prior analysis.

c. Beginning in August of 2012, Duke Energy IT Security shall provide Commission Staff with updates on the development of its SmartGrid cyber security plan and on the implementation of that plan. The scope of the 2012 report will include, but not be limited to, the strategy and methodology used to assess the conformity of Duke Energy Ohio's SmartGrid security with the requirements identified above (*i.e.*, those having high potential of a security breach and no conformity) and other applicable industry standards. Briefings in subsequent years shall include those security requirements to the extent the associated risks have not been mitigated, and address relevant elements of the NISTIR that apply to new SmartGrid

technology developments and deployments that have not been subject to prior analysis.

d. Duke Energy IT Security will update Commission Staff at least annually, and shall keep Commission Staff informed of the progress being made every six months. The annual update shall address both a forward look to the next year in terms of what risks will be considered, and a backward look at which risks have been addressed, and how they have been addressed. In addition, the annual update will speak to changes to security requirements in NISTIR 7628 (volumes 1&3) and the Company's assessment and mitigation of those changes. Further, the update will incorporate a cyber assessment and mitigation efforts in response to those changes by determining any impact to previously conforming or partially conforming recommendations contained in the NISTIR or other applicable security frameworks. Finally, the update will incorporate a SmartGrid cyber security RA and mitigation strategy regarding significant smart grid infrastructure changes.

The updates shall include:

i. Merged Companies cyber security plan - Six months after Duke Energy Corp. and Progress Energy close the merger, the Company shall provide a confidential report to Commission Staff describing the substance of the SmartGrid cyber security plan for the merged companies. The report will include coverage of best practices and procedures of both companies, and how the incorporation of those best practices and procedures has been or will be accomplished. The report will also include an assessment of new

risks and vulnerabilities given the increased scale and scope of the merged systems.

ii. Annual Written Preview to Commission Staff - This document will cover the scope and context of items (*i.e.*, from what organization or standards body the standards came from) to be included in the on-going RA and mitigation strategy conducted as part of the SmartGrid cyber security plan. The preview document will be confidential and will not be distributed.

iii. Annual Briefing - The annual presentation will be in person. It will cover the results of the RA and mitigation strategy and implementation programs (risk determinations, response, mitigation steps, acceptance of risk, and status of completion). The presentation will be confidential and only include appropriate members of the Commission Staff. The presentation will be in September and annually thereafter through 2014.

V. SMARTGRID IMPLEMENTATION PLANS

a. The Company agrees to enter into a process with Commission Staff to develop the framework for SmartGrid Implementation Plans (Plan) to be completed by the Company annually. The initial Plan for years 2013 through 2015 will be presented by October 30, 2012. An objective of the Plan will be to help stakeholders understand the Company's plans to invest in the distribution business in three areas: 1) improvements in (or maintenance of) distribution reliability and efficiency; 2) improvements in distribution customer services; and 3) reductions in distribution business operations costs and risks, and to understand what actions

will be taken to adapt organizational structures and practices to deliver benefits. The Plans will be for information purposes only and not subject to approval or rejection by Commission Staff or stakeholders. The Company shall provide the Plans to the participants in the Duke SmartGrid Collaborative. Through the Collaborative, Commission Staff and stakeholders may provide suggestions on the Company's Plans, but all decision rights regarding Plan execution and modification will remain with the Company. Receipt and review by Commission Staff does not constitute pre-approval of the investments nor limit Commission Staff's rights during subsequent proceedings.

VI. RELIABILITY AND DISTRIBUTION EFFICIENCY IMPROVEMENT

a. The Company shall work with the Commission Staff and OCC to develop Distribution Efficiency Improvement Measurements. In development of Distribution Efficiency Improvement Measurements, consideration will be given to the cost effectiveness and availability of providing the following:

   i. System performance data demonstrating distribution efficiency measures as set forth in Attachment 3.

   ii. Data as set forth in Attachment 3 for varying load conditions (including but not limited to peak load, average load, and light load conditions).

   iii. Method or methods of field measurement verification that may include but not be limited to the following:

      1. Determining the annual average power factor per feeder circuit.

2. Running an on-line power flow program to determine what would happen without volt-var control and then comparing the result with actual field measurements.

3. Using day on/day off testing, where voltage is reduced every other day on a test circuit, and then compare the measurement from the voltage reduction on-day with the voltage reduction off-day using statistical analysis.

b. Validation Estimate and Edit (VEE)—Duke Energy Ohio agrees to meet with Commission Staff and OCC by the end of the second quarter of 2012 to determine appropriate reporting to indicate effectiveness of VEE routines in the Meter Data Management System (MDMS). Duke Energy Ohio will meet with Commission Staff and interested parties semi-annually through 2014 to review results.

c. Distribution Automation integration with rest of system

i. The Company will provide to Signatory Parties a written copy of its Distribution Management System (DMS) Deployment plan.

ii. The Company will provide to Signatory Parties an annual report of its progress against the DMS Deployment plan in its SmartGrid Rider filings beginning with the SmartGrid Rider filing in 2012 (2011 cost recovery).

iii. The Company will provide a DMS demonstration/briefing to Commission Staff and interested parties by the end of 2nd quarter 2012.

d. With respect to meter data integration with the rest of the Duke Energy Ohio system, the Company agrees to develop a cost benefit analysis for each of the

following opportunities (which are detailed on pages 40-43 of the MetaVu Report):

i. Meter status for proactive outage detection – The MetaVu Report at page 41, states that proactive outage detection will be available with DMS deployment and Distribution Outage Management System (DOMS) integration. In response to MetaVu's recommendation, the Company will notify the Signatory Parties if there are additional costs to enhance this capability, including battery back-up, and a rough estimate of such costs on or before June 30, 2012.

ii. Meter data for power quality (voltage) to enhance integrated voltage var control (IVVC) benefits on or before June 30, 2012.

iii. Meter data for capacity planning, including use of meter data in a Circuit Modeling Tool (CMT) and use of a data bus for associated data integration on or before June 30, 2012.

iv. Meter data to help confirm accurate operation of Power Manager switches for load management verification on or before June 30, 2012.

v. Substation condition monitoring (such as oil temperature, pressure, and gas levels) on or before June 30, 2012.

vi. Based on the cost benefit analyses referenced in the above items, the Company will provide its conclusions and describe any plans with respect to each of the opportunities listed above.

IN WITNESS THEREOF, the undersigned Parties agree to this Stipulation and Recommendation as of this 24th day of February, 2012. The undersigned Parties respectfully request the Commission to issue its Opinion and Order approving and adopting this Stipulation.

On Behalf of Staff of the Public Utilities Commission of Ohio

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Duke Energy Ohio Case No. 10-2326
Allocation of SmartGrid Benefits [1]

Benefit #	Benefit Name	Benefit Type	2011			2012			2013			2014			2015		
			Gas [2]	Electric	Total	Gas [2]	Electric	Total	Gas [2]	Electric	Total	Gas [2]	Electric	Total	Gas [2]	Electric	Total
1	Regular Meter Reads	Avoided O&M Cost	$0.205	$0.335	$0.540	$0.498	$0.812	$1.310	$1.113	$1.817	$2.930	$1.725	$2.815	$4.540	$2.288	$3.732	$6.020
2	Off-Cycle / Off-Season Meter Reads	Avoided O&M Cost	0.730	1.190	1.920	1.296	2.114	3.410	1.927	3.143	5.070	2.333	3.807	6.140	2.652	4.328	6.980
3	Remote Meter Diagnostics	Avoided O&M Cost	-	0.140	0.140	-	0.310	0.310	-	0.500	0.500	-	0.680	0.680	-	0.800	0.800
7	Meter Operations Costs	Avoided O&M Cost	-	0.050	0.050	-	0.120	0.120	-	0.200	0.200	-	0.260	0.260	-	0.310	0.310
10	Outage Detection	Avoided O&M Cost	-	0.010	0.010	-	0.030	0.030	-	0.050	0.050	-	0.060	0.060	-	0.070	0.070
11	Outage Verification	Avoided O&M Cost	-	0.110	0.110	-	0.250	0.250	-	0.410	0.410	-	0.540	0.540	-	0.660	0.660
15	Continuous Voltage Monitoring	Avoided O&M Cost	-	-	-	-	-	-	-	0.080	0.080	-	0.160	0.160	-	0.240	0.240
19	Capacitor Inspection Costs	Avoided O&M Cost	-	-	-	-	-	-	-	0.060	0.060	-	0.130	0.130	-	0.200	0.200
20	Circuit Breaker Inspection Costs	Avoided O&M Cost	-	0.020	0.020	-	0.050	0.050	-	0.080	0.080	-	0.090	0.090	-	0.100	0.100
21	Call Center Efficiency	Avoided O&M Cost	-	0.030	0.030	-	0.060	0.060	-	0.090	0.090	-	0.120	0.120	-	0.140	0.140
22	Increase in Safety	Avoided O&M Cost	0.008	0.012	0.020	0.015	0.025	0.040	0.027	0.043	0.070	0.038	0.062	0.100	0.042	0.068	0.110
23	Billing Savings - Shortened Billing Cycle	Avoided O&M Cost	0.011	0.019	0.030	0.019	0.031	0.050	0.027	0.043	0.070	0.030	0.050	0.080	0.030	0.050	0.080
24	Vehicle Management Costs	Avoided O&M Cost	0.087	0.143	0.230	0.198	0.322	0.520	0.315	0.515	0.830	0.418	0.682	1.100	0.490	0.800	1.290
4/5	Power Theft / Theft Recovery Costs	Increased Revenue	-	0.180	0.180	-	0.380	0.380	-	0.620	0.620	-	0.810	0.810	-	0.990	0.990
8	Meter Accuracy Improvement	Increased Revenue	-	0.190	0.190	-	0.400	0.400	-	0.660	0.660	-	0.870	0.870	-	1.070	1.070
9	Meter Salvage Value	Increased Revenue	-	0.100	0.100	-	0.210	0.210	-	0.220	0.220	-	0.170	0.170	-	0.160	0.160
12	Outage Reductions	Increased Revenue	-	0.140	0.140	-	0.250	0.250	-	0.370	0.370	-	0.480	0.480	-	0.540	0.540
	TOTALS		$1.041	$2.669	$3.710	$2.026	$5.364	$7.390	$3.409	$8.901	$12.310	$4.544	$11.786	$16.330	$5.502	$14.258	$19.760
	Exclude "generation" share of increased revenue benefit [1]			0.293	0.293		0.595	0.595		0.898	0.898		1.118	1.118		1.325	1.325
	Transmission & Distribution Savings		$1.041	$2.376	$3.417	$2.026	$4.769	$6.795	$3.409	$8.003	$11.412	$4.544	$10.668	$15.212	$5.502	$12.933	$18.435

Notes: [1] *Benefits as provided in the MetaVu Audit Report.*

[2] For benefits that accrue to gas and electric customers, allocated based on number of customers.

	Gas	Electric
Percentage of Total Customers	38%	62%

Electric SmartGrid Benefits (2011-2014)

Electric Share of 2011-2014 SG Benefit	2011	2012	2013	2014
T& D Savings per MetaVu	$2.38	$4.77	$8.00	$10.67
Annual O&M reduction	$6.24	$6.24	$6.24	$6.24
Deferred Costs	$3.86	$1.47	($1.76)	($4.43)

General

Metavu Benefit #		Metric	Baseline	2011	2012	2013	2014	Steady State
		# of Certified Gas Modules						
		# of Certified Electric Meters						
		# of Duke Energy Ohio Employees - Gas Operations						
		# of Duke Energy Ohio Employees - Power Delivery						
		Line loss & Unaccounted for Electric (Kwh)						
		Total Delivered at Retail - Kwh						
		# of Installed & Certified Communication Nodes						
13	24-365 System Voltage Reduction Strategy	Average System Voltage						
2	Off-Cycle/Off-Season Meter Reads	Remote Order Fulfillments as % of Total Meter Orders						
		# of Manual Electric Meter Reads						
		# of Manual Gas Meter Reads						
		# of Non-pay Disconnects - Electric						
1	Regular Meter Reads	# of Meter Readers, expressed in FTE						
		Certified Meters as % of Planned Total Deployment						
		# of Meter Reading Routes						
6	Meter Operations Capital	# of Handhelds Repaired						
		# of Handhelds Purchased						
		# of Non-AMI Meters Purchased						
		# of Meters Repaired - Mechanical						
		# of Meters Failed - Electric Smart Meter						
		# of Gas Modules Failed						
24	Vehicle Management Costs	# of Meter Reading Vehicles						
		Average Miles per Meter Reading Vehicle						
3	Remote Meter Diagnostics (individual customer)	# of Truck Rolls Avoided (Outage)						
		# of Truck Rolls Related to an Outage						
12	Outage Reductions	# of Node-notified Storm Event Outages						
11	Outage Verification	# of Node-notified Outages						
		# of Self-Healing Teams						
		# of Customer minutes saved from Self Healing events						
4, 5	Power Theft/Theft Recovery Costs	# of AMI Power Theft Cases Billed						
16	VAR Management	% Capacitor Off-line						
		# of Capacitor Banks Installed						

Attachment 3

Distribution Efficiency Measurement
Provide the following data annually with Duke's Smart Grid Rider filing, starting in 2012 (2011 cost recovery).

Station Number	Substation Name	Circuit Name	Voltage (kV)	2010 Sum Peak Load (kW)	2010 Sum Losses (kW)	2010 Sum Peak Demand	Losses (%)	Power Factor

This data derived from actual load measurements (taken from load side of substation transformer) and entered into existing circuit models to calculate percent losses by circuit. Percent losses as reported here reflect only the losses in the distribution feeder itself; it excludes losses in the substation transformer, distribution transformer, and secondary system.

Summary: Exhibit Exhibits 1-13 for Deposition Transcript of Donald Schneider filed on Behalf of the Office of the Ohio Consumers' Counsel electronically filed by Ms. Deb J. Bingham on behalf of Healey, Christopher Mr.