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. 21-887-EL-AIR
In the Matter of the Application of Duke Energy Ohio, Inc., for Tariff Approval.	)))	Case No. 21-888-EL-ATA
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods.	)))	Case No. 21-889-EL-AAM

DIRECT TESTIMONY OF

JEFFREY W. HESSE

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: Distribution System

October 15, 2021

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jeffrey W. Hesse, and my business address is 7600 Colerain Avenue, Cincinnati, Ohio 45239.

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

A. I am employed by Duke Energy Business Services LLC (DEBS), as Director of Asset Design. DEBS provide various administrative and other services to Duke Energy Ohio, Inc., (Duke Energy Ohio or the 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 Mechanical and Manufacturing Engineering Technology from Northern Kentucky University and a Master's Degree in Business Administration from Thomas More University. I began my career at Cinergy Corp., as a mechanical engineering co-op in 2002, and have held a variety of positions of increasing responsibility across Duke Energy in the areas of gas and distribution engineering.

Q. PLEASE DESCRIBE YOUR DUTIES AS DIRECTOR OF DISTRIBUTION ASSET DESIGN.

A. In my current role, I am responsible for the group that designs the major project and integrity programs for the Company's operations in Duke Energy Ohio's Northern zone. I am also responsible for engineering and design for road improvement projects in that same northern zone.

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

A. No.

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

A. The purpose of my testimony is to provide an overview of Duke Energy Ohio's electric distribution system and explain how Duke Energy Ohio maintains and meets its reliability commitments and makes the investments necessary to continue to provide safe, reliable, and reasonably priced service to its more than 700,000 electric customers located in southwestern Ohio. In doing so, I discuss the challenges the Company faces in maintaining its electric distribution system and explain the current initiatives the Company undertakes to maintain the safety and integrity of its infrastructure. My testimony supports the necessary capital investments the Company has made since the time of its last electric distribution base rate case, including those that have been recovered via its Distribution Capital Investment Rider (Rider DCI), and describe the continued investments necessary going forward to meet existing reliability commitments and to continue providing safe and reliable electric distribution service. I support the need for the Company's request to adjust the current revenue requirement caps for incremental distribution system investments recoverable through its Rider DCI. Finally, I sponsor the Distribution Capital Investments 4-Year Plan (Attachment JWH-1).

II. DUKE ENERGY OHIO'S ELECTRIC DISTRIBUTION SYSTEM

Q. PLEASE BRIEFLY DESCRIBE DUKE ENERGY OHIO'S EXISTING ELECTRIC DISTRIBUTION INFRASTRUCTURE.

A. The Duke Energy Ohio electric delivery system provides electric service to more than 700,000 customers located throughout southwestern Ohio. Duke Energy Ohio owns and operates all of its electric distribution and local transmission facilities.

Duke Energy Ohio's electric delivery system includes approximately 250 substations, 24 transmission substations, having a combined capacity of approximately 9,940,000 kilovolt-amperes (kVA); 192 distribution substations, having a combined capacity of approximately 4,627,000 kVA; and 34 joint transmission and distribution substations, having a combined capacity of approximately 7,031,000 kVA. The Duke Energy Ohio electric delivery system includes various other equipment and facilities, such as control rooms, computers, capacitors, streetlights, meters and protective relays, and telecommunications equipment and facilities.

Q. PLEASE GENERALLY DESCRIBE HOW THE ELECTRIC DISTRIBUTION INFRASTRUCTURE IS DESIGNED, CONSTRUCTED, MANAGED, AND OPERATED.

A. The electric distribution infrastructure is designed to receive bulk power at transmission voltages, reduce the voltage to 34.5 kV, 12.5 kV, or 4 kV, and deliver power to customers' premises. The distribution infrastructure generally consists of substation power transformers, switches, circuit breakers, wood pole lines, underground cables, distribution transformers, and associated equipment. The physical design of the distribution system is also generally governed by the National Electrical Safety Code, which, I understand, has been adopted by the state of Ohio in Ohio Administrative Code (O.A.C.) 4901:1-10-06.

Duke Energy Ohio operates the electric distribution facilities it owns in accordance with good utility practice. Duke Energy Ohio continuously runs the system with a workforce that provides service 24 hours per day, 7 days per week, 365 days per year, and includes trouble response crews. The Company monitors outages with various systems, such as Supervisory Control and Data Acquisition, Distribution Outage Management System, and the Distribution Management System.

Q. PLEASE GENERALLY DESCRIBE HOW DUKE ENERGY OHIO CURRENTLY MONITORS AND MAINTAINS ITS ELECTRIC DISTRIBUTION INFRASTRUCTURE AND ITS PERFORMANCE.

A. Duke Energy Ohio maintains its electric distribution infrastructure in accordance with good utility practice by adhering to inspections, monitoring, testing, and periodic maintenance programs. Examples of these existing programs include, but are not limited to, the following: (1) substation inspection program; (2) line inspection program; (3) ground-line inspection and treatment program; (4) vegetation management program; (5) underground cable replacement program; (6) capacitor maintenance program; and (7) dissolved gas analysis.

Duke Energy Ohio also uses various reliability indices to measure the effectiveness of its maintenance programs and system reliability. The Company follows the Public Utilities Commission of Ohio's (Commission) Electric Service and Safety Standards, as set forth in O.A.C. Chapter 4901:1-10. The Company also uses various indices to measure the effectiveness of its maintenance programs and system reliability.

Q. YOU STATED THAT DUKE ENERGY OHIO USES VARIOUS INDICES TO MEASURE THE EFFECTIVENESS OF ITS MAINTENANCE PROGRAMS AND SYSTEM RELIABILITY. PLEASE EXPLAIN THESE RELIABILITY INDICES.

A. Reliability indices are generally recognized standards for measuring the number, scope, and duration of outages. Ohio requires electric distribution utilities to report annually on these reliability indices. These indices are defined as follows:

- System Average Interruption Duration Index (SAIDI) is the average time each customer is interrupted and is expressed by the sum of customer interruption durations divided by the total number of customers served.
- System Average Interruption Frequency Index (SAIFI) represents the average number of interruptions per customer. SAIFI is expressed by the total number of customer interruptions divided by the total number of customers served.
- Customer Average Interruption Duration Index (CAIDI) is the average interruption duration or average time to restore service per interrupted customer and is expressed by the sum of the customer interruption durations divided by the total number of customer interruptions.

Q. HAS DUKE ENERGY OHIO COMMITTED TO SPECIFIC RELIABLITY PERFORMANCE METRICS?

A. Yes. As part of the Stipulation and Recommendation (Stipulation) that resolved the Company's last electric distribution base rate case and Electric Security Plan (ESP), the Company agreed to the following reliability targets[1]:

YEAR	CAIDI	SAIFI
2018	134.34	1.12
2019	134.34	1.00
2020	134.34	0.91
2021	135.52	0.83
2022 through 2025	137.00	0.75

Q. HOW HAS DUKE ENERGY OHIO'S ELECTRIC DISTRIBUTION INFRASTRUCTURE PERFORMED, AS MEASURED BY THESE RELIABILITY INDICES?

A. Duke Energy Ohio has performed well. Its reliability scores have met the targets outlined in the Stipulation and as required by the Commission's rules. The Company's results are shown on this table[2]:

Duke Energy Ohio Reliability Scores								
Year	**CAIDI Perfor-mance Standard**	**CAIDI Before Exclusion**	**CAIDI After Exclusion**	**SAIFI Perfor-mance Standard**	**SAIFI Before Exclusion**	**SAIFI After Exclusion**	**SAIDI Before Exclusion**	**SAIDI After Exclusion**
2018	**134.34**	**204.78**	**130.22**	**1.12**	**1.56**	**1.01**	**320.14**	**132.07**
2019	**134.34**	**129.20**	**118.47**	**1.00**	**1.09**	**0.86**	**140.72**	**102.24**
2020	**134.34**	**186.27**	**130.62**	**0.91**	**1.14**	**0.82**	**213.09**	**107.12**

[1] *In the Matter of the Application of Duke Energy Ohio, Inc., for an Increase in Electric Distribution Rates*, Case No. 17-32-EL-AIR, *et al.*, Stipulation and Recommendation, p.13 (April 13, 2018).

[2] *In the Matter of the Annual Report of Electric Distribution System Reliability Pursuant to Rule 4091:1-10-10 (C),* Case Nos. 19-0994-EL-ESS, 20-0994-EL-ESS and 21-0994-EL-ESS.

III. EXISTING RIDER DCI

Q. PLEASE DESCRIBE RIDER DCI.

A. Rider DCI was approved by the Commission in a previous electric security plan case.[3] The purpose of Rider DCI is to allow the Company to timely recover a return of and on incremental capital investment in electric distribution plant necessary to maintain the safety and reliability of its delivery system, and recover the associated property tax and depreciation expenses. In summary, the rider recovers the Company's incremental revenue requirement for distribution capital investment, including but not limited to ongoing maintenance capital, as well as the cost to implement various specific programs or initiatives designed to harden and maintain the safety and reliability of the Company's distribution system. Rider DCI also recovers incremental revenue requirement on other plant necessary for the safe and reliable operation of the Company's electric distribution system.

The capital investments recovered through Rider DCI are designed to manage costs, increase customer reliability, and proactively address aging infrastructure issues through a targeted and coordinated approach. The capital investment included for recovery through Rider DCI includes all capital placed in service and accounted for in FERC accounts 360 to 374.

[3] *In the Matter of the Application of Duke Energy Ohio 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. 14-841-EL-SSO, *et al.* (hereinafter, ESP III).

Q. PLEASE DISCUSS THE WORK THAT HAS BEEN ACCOMPLISHED AND RECOVERED THROUGH RIDER DCI.

A. Duke Energy Ohio's electric distribution capital investments are helping to usher in the grid of the future in Ohio. These investments, at a base level, are focused on:

- Safety: minimizing equipment failures, and the associated dangers for employees, customers, and the general public;
- Reliability: limiting frequency and duration of service interruptions and other power quality issues; and
- Resilience: preventing or withstanding damage from major disruptive events, such as storms and improved restoration times.

Since its last electric distribution base rate case, the Company has made significant investments in its electric distribution infrastructure, including: underground cable replacement, circuit sectionalization, deteriorated conductor, and pole replacement programs, to name a few. These proactive efforts have resulted in measurable improvements in reliability and customer minutes interrupted.

Q. PLEASE PROVIDE EXAMPLES OF HOW DUKE ENERGY OHIO'S DISTRIBUTION CAPITAL INVESTMENTS HELP IMPROVE RELIABILITY AND REDUCE CUSTOMER MINUTES INTERRUPTED.

A. Duke Energy Ohio has been and will continue to invest in programs that improve the overall reliability of the grid. These reliability improvements are designed to proactively reduce the number of outages, minimize the number of customers affected by an outage, and improve outage response, as well as expediting service restoration, all of which contribute to a reduction in the total number of customer minutes interrupted. Examples of these investments include self-optimizing grid, targeted undergrounding, circuit sectionalization, and 4 kV conversion.

Q. PLEASE EXPLAIN WHAT A SELF-OPTIMIZING GRID IS AND HOW IT HAS HELPED IMPROVE RELIABILITY AND REDUCE CUSTOMER MINUTES INTERRUPTED.

A. As customers expect more from the Company, it must invest in the electric distribution grid to provide ever-improving service. Duke Energy Ohio utilizes technology that supports faster restoration, effectively decreasing outage duration and the inconveniences of its customers.

Today the Company's system is generally constructed for one-way power flow in a radial design with limited ability to integrate renewable energy. The self-optimizing grid, also known as the smart-thinking grid, redesigns key portions of the distribution system and transforms it into a dynamic self-healing network that ensures issues on the grid can be isolated and customer impacts are limited. These grid capabilities are enabled by installing automated switching devices to divide circuits into switchable segments that will serve to isolate faults and automatically reroute power around trouble areas. Such devices call for expanding line and substation capacity to allow for two-way power flow and creating tie points between circuits. Self-optimizing grid investments:

- Increase system “connectivity” by building more circuit ties that allow for more flexibility in restoration options, thus shifting the system from a radial design to more of a “spider web” design;
- Increase “capacity” by installing larger wires, transformers, and system banks to be able to handle dynamic switching and increased two-way power flow from adjacent circuits and renewable generation; and
- Increase “control” through additional system automation and intelligence, which are becoming a necessary requirement to manage an increasingly dynamic system.

With increased connectivity, capacity, and control, the Company has an increasingly more resilient distribution system with greater flexibility in restoration options. Instead of having circuit pairs that can back each other up, the network allows for multiple options to re-energize circuit segments. The self-optimizing grid also provides the foundation for the two-way power flows needed to support rooftop solar, battery storage, electric vehicles, and microgrids – technologies that will increasingly power the lives of customers in Ohio.

Since 2018, the Company’s self-healing networks have prevented over 505,000 customer interruptions and over 67.5 million customer minutes of interruption.

Q. PLEASE EXPLAIN WHAT TARGETED UNDERGROUNDING IS AND HOW IT HAS HELPED IMPROVE RELIABILITY AND REDUCE CUSTOMER MINUTES INTERRUPTED.

A. Targeted underground (TUG) is a strategic program that targets outage-prone, rear-lot, heavily vegetated lines for conversion to underground service. TUG projects typically target "end of feeder" customers who are often lower on the priority list for restoration during storm events. This is because restoration priority is based upon restoring the largest number of customers as quickly and safely as possible. These "end of feeder" customers are typically fewer in number, and likely in isolated or remote areas in the service territory thus, typically experience longer outage durations during major storms. TUG customers are selected by reviewing 10-year outage history and identifying line segments that meet TUG criteria: (1) approximately two times worse reliability than the average customer; (2) mostly residential areas; and (3) heavily vegetated rear-lot overhead lines that are difficult to access and maintain.

Since its inception in late 2018, TUG has converted approximately 1,000 customers to underground service in Ohio. The TUG program is estimated to have prevented 117 individual outage events, 649 customer interruptions and 142,642 customer minutes interrupted.

Q. PLEASE EXPLAIN WHAT CIRCUIT SECTIONALIZATION IS AND HOW IT HELPS TO IMPROVE RELIABILITY AND REDUCE CUSTOMER MINUTES INTERRUPTED.

A. Circuit sectionalization is a systematic approach whereby additional fuses and protection devices are added to an existing circuit. This reduces the number of customers affected by an outage.

Currently, a single set of fuses protects upstream customers from experiencing an outage but, with circuit sectionalization, several additional protective devices are installed. This fuse coordinated approach keeps one circuit segment issue at the end of the circuit from affecting more customers upstream. This program also reduces outage duration because the length of the line that requires troubleshooting is reduced, allowing for a more accurate and timely pinpointing of the outage and more efficient restoration. Circuit sectionalization is vital to reliability targets as the Company continues to invest in programs to reduce customer minutes interrupted.

Q. PLEASE EXPLAIN WHAT 4KV CONVERSION IS AND HOW IT HELPS TO IMPROVE RELIABILITY AND REDUCE CUSTOMER MINUTES INTERRUPTED.

A. The 4kV conversion program replaces aging infrastructure with Company standard 12kV equipment. There are approximately 126 4kV circuits on the system, with aged equipment ranging from the substation transformer to the customer's meter. Benefits of the 4kV conversion program include: 1) increased reliability by installing additional line reclosers; 2) elimination of aged, end-of-life equipment that has become less reliable and is difficult to replace due to obsolescence; 3) ability of upgraded circuits to join in with neighboring standard 12kV circuits to create a more networked grid with self-healing capabilities instead of being constrained to only adjacent 4kV circuit pairs, thus creating an increasingly more resilient system with greater flexibility in restoration options; and 4) opportunities for more distributed energy resource (DER) integration, as upgrading the circuits to current standards will enable the infrastructure to support the necessary two-way power flow.

Q. DOES THE ELECTRIC DISTRIBUTION WORK INCLUDED IN RIDER DCI PROVIDE ANY OTHER BENEFITS TO CUSTOMERS?

A. Yes. In addition to the reliability improvements and reduction in customer minutes interrupted benefits discussed above, the programs included for recovery in Rider DCI help the Company manage and control its costs and its workforce resources, allowing for more efficient processes. Updating and replacing the Company's aging distribution equipment enables greater resiliency in the system. Because many of the programs included for recovery in Rider DCI are implemented throughout the Company's service territory, every customer ultimately benefits from efficiencies and system hardening.

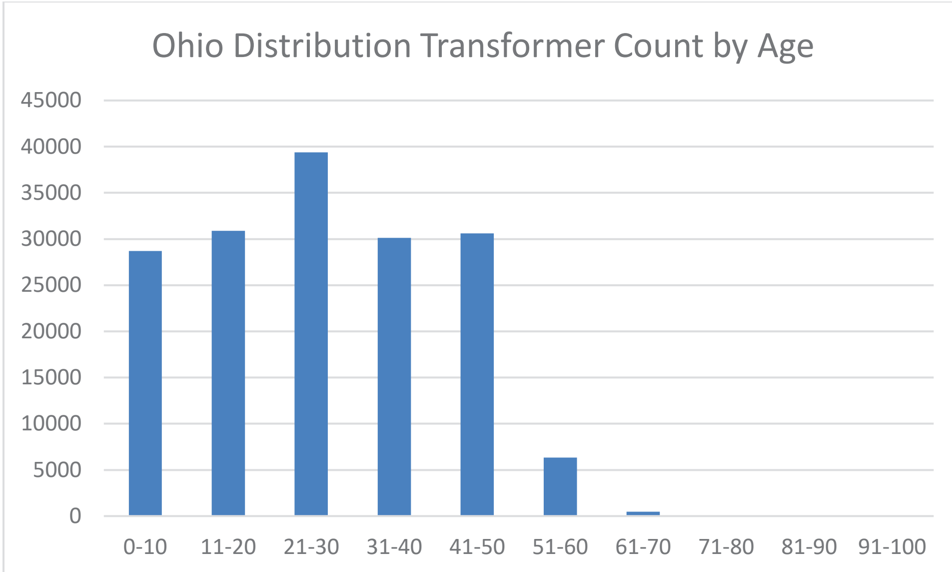
IV. DISTRIBUTION CAPITAL INVESTMENT GROWTH

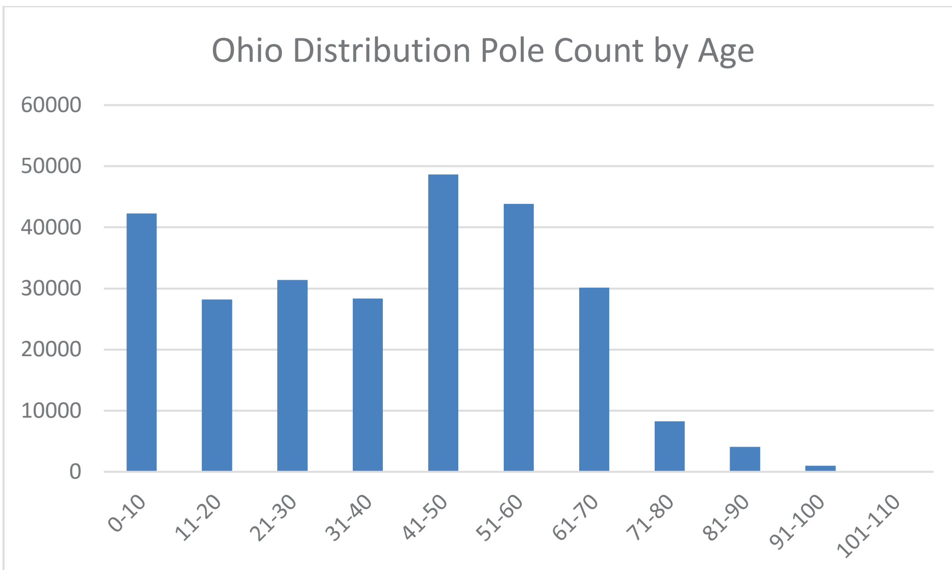
Q. PLEASE DISCUSS THE DRIVERS OF THE GROWTH IN DISTRIBUTION CAPITAL INVESTMENTS SINCE THE LAST RATE CASE.

A. The growth in Duke Energy Ohio's electric distribution capital investments is driven by the replacement of aging infrastructure, reliability improvements, and the growth in customers' desire for more DERs. Electric distribution investments have also been impacted by increases in localized load growth and costs to execute capital investments.

Q. PLEASE ELABORATE ON THE "REPLACEMENT OF AGING INFRASTRUCTURE" GROWTH DRIVER.

A. Electric distribution capital spend continues to increase as aged infrastructure is replaced or upgraded with advanced materials and new technology that will allow the electric distribution system to better withstand extreme weather events, enable better monitoring and control, and accommodate more DERs. Aged infrastructure is a challenge because the equipment is at or near the end of its useful life, is less reliable, and takes longer to restore during an outage because parts are no longer manufactured. Much of this equipment is over 40 years old. This equipment typically will last from 30–50 years. We expect to incur substantial expenditures to replace this equipment during the next several years. The charts below show the age distribution of Duke Energy Ohio's electric distribution transformers and poles.





Duke Energy Ohio has inspection and end-of-life programs to address these aging assets. There are also other aging infrastructure programs such as 4kV conversion, previously discussed in my testimony.

Q. PLEASE ELABORATE ON THE "RELIABILITY IMPROVEMENTS" AND "CUSTOMERS' DESIRE FOR MORE DISTRIBUTED ENERGY RESOURCES" GROWTH DRIVERS.

A. Improving reliability involves a long-term effort with many elements that contribute to overall success. Reliability is dynamic and must be dealt with continuously and with sustained effort. Without constant management and investment, the system may unintentionally decline or deteriorate. Further, as the Company continues to invest in proactive electric distribution maintenance programs to improve reliability and specifically help reduce customers' minutes interrupted, reliability targets have also increased. The reliability targets, as outlined above, have increased year over year and although the Company has achieved those targets thus far, pressures to continue to meet the aggressive targets are also increasing. For example, the 2021 reliability goals of .83 SAIFI and 135.52 CAIDI require a higher level of investment, as the Company has completed many of its low-cost reliability projects and only higher cost reliability programs remain.

These reliability programs are how Duke Energy Ohio is transforming its electric distribution grid from a one-way power system to one that is distributed, cleaner, and interconnected, with two-way power flows. Collectively, Duke Energy Ohio's distribution capital investments leverage grid automation, data management and automated grid sensors, and communication and response capability, to effectively integrate a greater proportion of renewable and distributed energy resources across its distribution grid network, while improving grid reliability, economic performance and customer choice.

Q. PLEASE ELABORATE ON THE "INCREASE IN COST" GROWTH DRIVER.

A. Increases in the costs to complete the same amount of work have also driven growth in distribution capital investments. An example of this is external line personnel costs, which have increased approximately 43% since 2017. While Duke Energy Ohio does include increases for inflation in its estimates, no one could have predicted increases of this magnitude. Utilities across the country are increasing their investments in the grid, thereby driving higher demand for experienced line personnel.

Q. PLEASE ELABORATE ON THE "LOCALIZED LOAD GROWTH" DRIVER.

A. Stress to the distribution system in the form of system demand (despite small growth in customer base) has driven investment growth as well. There have been pockets of strong localized growth requiring larger capital investment where existing electric capacity was not sufficient. These localized capacity needs include things such as new substations, line upgrades and extensions, and the rebuilding of existing lines. Examples in the Duke Energy Ohio service territory include future customers 1 thru 4 in development stage (in table of example new customer additions). In addition to these larger, mixed-use type developments, the housing market has also turned since 2017 and demand for new subdivision infrastructure has followed that increase.

Example New Customer Additions in Duke's Ohio Service Territory with Substantial Capacity Requests*

	Expected Employment	Land Development (Acres)	Building Space (Square Feet)	Projected Demand (Mega Volt Amp)
Customer 1	300	TBD	1,200,000	30
Customer 2	TBD	26.8	40,000	5.3
Customer 3	TBD	22	356,800	19.9
Customer 4	40	17.4	55,000	10.2

*all values are based on estimates available for development

Q. WHAT IS YOUR UNDERSTANDING OF THE REMAINING TERM OF RIDER DCI?

A. My understanding is that Rider DCI has been authorized to continue through the term of the Company's current ESP. That ESP expires May 31, 2025.

Q. HAS THE COMPANY QUANTIFIED THE NECESSARY CAPITAL INVESTMENTS IT PLANS TO INCLUDE IN RIDER DCI THROUGH THE TERM OF THE CURRENT ESP?

A. Yes. See Attachment JWH-1.

Q. WHAT IS YOUR UNDERSTANDING OF THE RIDER DCI REVENUE REQUIREMENT CAPS?

A. As outlined in Duke Energy Ohio witness Sarah E. Lawler's testimony, the Rider DCI caps that were set in the Stipulation allow for increases in annual Rider DCI revenue of $18.7 million per year for years 2021 through 2024. For the period of January 1, through May 31, 2025, the Rider DCI revenue cap will be in the range of $62.4 million and $66.3 million depending on the Company's reliability performance in prior years.

Q. WILL THE CAPITAL INVESTMENTS INCLUDED IN ATTACHMENT JWH-1 RESULT IN A REVENUE REQUIREMENT IN EXCESS OF THE CURRENT RIDER DCI CAPS?

A. Yes, that is my understanding. Ms. Lawler used the capital investment spend in my Attachment JWH-1 to calculate the needed revenue requirement for the Company to recover a return on and of these investments through Rider DCI. Per her calculations, the capital investments included in Attachment JWH-1 result in a revenue requirement in excess of the current Rider DCI caps. She outlines this in more detail in her testimony. However, this is the level of capital investment necessary to meet the reliability targets agreed upon in the Stipulation, continue to provide safe and reliable electric service, support the continued economic development of the communities that the Company serves, as well as to support the anticipated localized load growth.

Q. IS THE COMPANY REQUESTING AN INCREASE IN THOSE RIDER DCI CAPS IN THIS ELECTRIC DISTRIBUTION BASE RATE CASE?

A. Yes. Ms. Lawler discusses that request in detail in her direct testimony.

Q. PLEASE EXPLAIN WHY THE RIDER DCI CAPS MUST INCREASE TO CONTINUE TO MEET THE AGREED UPON RELIABILITY TARGETS IN THE STIPULATION.

A. The reliability targets agreed upon are aggressive. The Company has achieved those targets through 2020 by making the necessary investments needed to improve its system reliability. However, the Company cannot simply rest on its past performance and assume future compliance. As previously mentioned in my testimony, many of the lower cost programs have been completed and in order to continue meeting the aggressive targets, higher levels of investment are needed. As the Company has designed programs, outlined in Attachment JWH-1, to address replacement of aging infrastructure, reliability improvements, and the growth in customers' desire for more DERs, it must also consider additional challenges such as increases in localized load growth and costs to execute capital investments. Supply chain constraints due to the recent pandemic have led to longer lead times and inflation in these resources. In short, it is becoming more expensive to maintain and improve as the Company strives to meet its reliability commitments. In addition, other investments remain necessary, such as line extensions, relocations, and upgrades driven by factors other than reliability driven system upgrades.

The Company's total distribution capital investments each year are greater than what is included in Rider DCI.With the increase in distribution capital investments to achieve the aggressive targets and absent an increase in cap relief in Rider DCI, the Company will be filing more frequent base rate cases, with larger increases, compared with what customers otherwise experience through an annual Rider DCI mechanism.

V. CONCLUSION

Q. WAS ATTACHMENT JWH-1 COMPILED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes.

Q. IS THE INFORMATION YOU SPONSOR IN ATTACHMENT JWH-1 ACCURATE TO THE BEST OF YOUR KNOWLEDGE AND BELIEF?

A. Yes.

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

A. Yes.

Row	Capital Program	Program Description	Measures for Reliability Improvements	Expected Reliablility Improvements	Equipment Affected	Unit of Measure	2022 Plan	2023 Plan	2024 Plan	2025 Plan
1	Self-Optimizing Grid (SOG)	Installation of electronic reclosers, increased line capacity/connectivity, and increased substation capacity to network the distribution system with self-healing teams.	SOG reduces the number of customers affected by a long-term outage event by providing the means to reconfigure the distribution system and restore power to those areas not directly involved in the outage.	Proactive efforts to minimize the number of customers affected by an outage	Distribution feeders	Per feeder	$34.8	$33.4	$31.9	$32.0
2	Convert 4kV System	This conversion program updates the system to current standards, eliminates equipment at the end of useful life, and provides back-up from the existing 12 kV systems. In addition, the conversion enables grid modernization, such as Self-Optimizing Grid and IVVC, that was not possible on the 4kV systems.	Proactive asset replacement/upgrade program. There is positive impact to the reliability related to the prevention of future outages as well as the time required for restoration.	Proactive efforts to minimize the number of customers affected by an outage	Distribution feeders	Per feeder	$5.0	$10.0	$12.0	$15.0
3	Reliabiility & Integrity Programs	Instalaltion of new, and replacement of existing assets such as protective devices, conductor, capacitors, cable and transformers.	Asset renewal program. There is positive impact to reliability related to the prevention of future outages.	Effort to maintain system reliability	Various	Various	$48.8	$45.4	$46.7	$47.9
4	Advanced Metering Infrastructure (AMI)	Program replaces existing meters with smart meters that enable automated meter reading, remote connects/disconnects and quicker outage detection.	Upgrades meters to the AMI standard. 99+% of the meters slated for replacement are existing Echelon AMI meters, and the remaining 1% are AMR or walk-by non-AMR meters	Improved outage response	Meters	Per meter	$0.6	$0.0	$0.0	$0.0
5	Inspection Programs	Replacement/reinforcement of poles and other equipment identified during inspections.	Proactive asset renewal program. There is positive impact to reliability related to the prevention of future outages.	Proactive efforts to maintain system reliability	Poles and other capital assets	Per Work Order	$4.5	$4.5	$4.5	$4.5
6	Vegetation Management	This program includes all capital vegetation management work performed in Duke Energy Ohio.	There is positive impact to reliability related to the prevention of future outages.	Proactive efforts to maintain system reliability	N/A	N/A	$8.2	$8.5	$8.8	$9.0
7	System / Retail Capacity	New and / or rebuilt distribution substation and line capacity to serve customer load and maintain substation equipment integrity.	Required to maintain reliable service.	Proactive efforts to maintain system reliability	N/A	N/A	$67.7	$67.1	$63.0	$67.6
8	Distribution Circuit Improvement with Transmission Work	Duke Energy Ohio will rebuild transmission lines in 2020, many of which have a Distribution underbuild. This provides the opportunity to upgrade the Distribution equipment to improve reliability rather than simply transfer or rebuild to the same standards as existing Distribution facilities.	Proactive asset renewal program. Rebuilding to a newer standard can provide a positive impact to reliability related to the prevention of future outages.	Proactive efforts to maintain system reliability	N/A	N/A	$17.0	$17.5	$18.0	$18.6

9	Service Restoration	This capital program includes day-to-day work for service restorations which are excluded from the major event category of outages. This would include capital dollars for such things as equipment replacement from an outage and capital dollars associated with minor storm events.	There is no reliability impact.	N/A	N/A	N/A	$12.4	$12.8	$13.1	$13.4
10	Customer Service Work	This capital program is for work necessary for providing customers electric service in Duke Energy Ohio. It includes capital dollars for providing service to new customers, as well as upgrades to existing commercial, industrial and residential customers.	There is no reliability impact.	N/A	N/A	N/A	$30.3	$30.7	$31.8	$32.6
11	Distribution Equipment Relocation	This capital program involves the relocation of existing facilities in support of road improvements.	There is no reliability impact.	N/A	N/A	N/A	$9.0	$9.4	$9.7	$10.0
12	Customer Operations	This capital program is for the purchase of customer meters for providing customers electric service in Duke Energy Ohio.	There is no reliability impact.	N/A	N/A	Meters	$5.2	$5.2	$5.2	$5.2
13	Lighting	Capital replacements / additions of lighting not recovered under the OLE tariff.	There is no reliability impact.	N/A	N/A	N/A	$1.6	$1.6	$2.0	$2.0
14	**TOTAL**						**$245.1**	**$246.1**	**$246.7**	**$257.8**