BEFORE THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke)
Energy Ohio, Inc., for an Increase in) Case No. 17-32-EL-AIR
Electric Distribution Rates.)
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) Case No. 17-34-EL-AAM
Change Accounting Methods.)
In the Matter of the Application of Duke)
Energy Ohio, Inc., for Approval to) Case No. 17-872-EL-RDR
Modify Rider PSR.)
In the Matter of the Application of Duke)
Energy Ohio, Inc., for Approval to) Case No. 17-873-EL-ATA
Amend Rider PSR.)
In the Matter of the Application of Duke)
Energy Ohio, Inc., for Approval to) Case No. 17-874-EL-AAM
Change Accounting Methods.)
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))

In the Matter of the Application of Duke)
Energy Ohio, Inc., to Establish) Case No. 16-1602-EL-ESS
Minimum Reliability Performance)
Standards Pursuant to Chapter 4901:1-)
10, Ohio Administrative Code.	

PREFILED TESTIMONY IN SUPPORT OF THE STIPULATION

OF

JACOB J. NICODEMUS RELIABILITY AND SERVICE ANALYSIS DIVISION SERVICE MONITORING AND ENFORCEMENT DEPARTMENT PUBLIC UTILITIES COMMISSION OF OHIO

Staff Exhibit _____

June 25, 2018

1	1.	Q. Please state your name and business address.
2		A. My name is Jacob Nicodemus. My business address is 180 E. Broad Street,
3		Columbus, Ohio 43215.
4		
5	2.	Q. By whom are you employed?
6		A. I am employed by the Public Utilities Commission of Ohio (PUCO).
7		
8	3.	Q. Would you briefly state your educational background and work history?
9		A. I have a Bachelor of Applied Science degree in electro-mechanical engineering
10		from Miami University and have participated in a number of training seminars
11		related to various areas of the utility industry. I began my employment at the
12		PUCO in 2009 as a Utility Analyst in the Rates and Tariffs Department where I
13		worked primarily with gas cost recovery and related matters, including review of
14		utility tariffs with regard to commodity costs and rates. I was promoted in 2011 to
15		a Researcher 3 position in the gas pipeline safety section of the Service
16		Monitoring and Enforcement Department, and then promoted again in January
17		2014 to my current position.
18		
19	4.	Q. What is your present position with the PUCO and what are your duties?
20		A. I am a Utility Specialist 2 in the Reliability and Service Analysis Division of

1		the Service Monitoring and Enforcement Department. I am responsible for
2		monitoring and enforcing compliance with various minimum service standards for
3		regulated gas and electric companies, including, but not limited to, those related to
4		service reliability and consumer protections.
5		
6	5.	Q. What is the purpose of your testimony in this case?
7		A. The purpose of my testimony is to discuss the reliability of Duke Energy
8		Ohio's (the Company) distribution system as it relates to R.C. 4928.143(B)(2)(h)
9		and the Company's reliability standards pursuant to Ohio Adm.Code 4901:1-10-
10		10(B).
11		
12	6.	Q. Regarding the reliability of a distribution system, please describe your working
13		knowledge of R.C. 4928.143(B)(2)(h).
14		A. This statute requires that the Commission examine the reliability of the EDU's
15		distribution system and ensure that the EDU's and its customers' reliability
16		expectations are aligned and that the EDU is placing sufficient emphasis on and
17		dedicating sufficient resources to the reliability of its distribution system.
18		
19	7.	Q. How does Staff of the PUCO perform such an examination?

1		A. Staff of the PUCO (Staff) looks at the EDU's approved minimum reliability
2		performance standards and determines whether those standards have been met,
3		reviews and analyzes customer perception survey results, and if necessary, makes
4		recommendations to the Commission regarding reliability on a going-forward
5		basis.
6		
7	8.	Q. Please explain what is meant by "minimum reliability performance standards."
8		A. The minimum reliability performance standards are industry standards used to
9		measure and report reliability performance, and are defined by the Institute of
10		Electrical and Electronics Engineers, Inc. (IEEE) and outlined in the "IEEE Guide
11		for Electric Power Distribution Reliability Indices," also known as IEEE Std.
12		1366-2012.
13		
14	9.	Q. Which minimum reliability performance standards are reported by Ohio
15		EDUs?
16		A. The standards reported by the EDUs are the Customer Average Interruption
17		Duration Index (CAIDI) and the System Average Interruption Frequency Index
18		(SAIFI). A third standard which is not required to be reported per Ohio
19		Administrative Code but that I will refer to is the System Average Interruption
20		Duration Index, or SAIDI.

2	10.	Q. Please explain what CAIDI measures and how it is calculated.
3		A. CAIDI is a measure of the average time required to restore a customer who
4		experiences an outage, reported as minutes per customer interrupted. It is
5		calculated by summing the duration of all interruptions experienced by customers,
6		and dividing that number by the total number of individual customer interruptions.
7		
8	11.	Q. Please explain what SAIFI measures and how it is calculated.
9		A. SAIFI is a measure of the average number of interruptions that a customer may
10		experience, reported as interruptions per customer. It is calculated by summing
11		the total number of individual customer interruptions, and dividing that number by
12		the total number of customers on the system.
13		
14	12.	Q. Please explain what SAIDI measures and how it is calculated.
15		A. SAIDI is a measure of the average outage time a customer on the system may
16		experience, reported as minutes per customer. It is calculated by summing the
17		duration of all individual customer interruptions, and dividing that number by the
18		total number of customers on the system.

1 13. Q. How are CAIDI and SAIFI standards established for each EDU?

2		A. Ohio Adm.Code 4901:1-10-10(B)(2) states that an electric utility must file an
3		application to establish company-specific minimum reliability performance
4		standards. Ohio Adm.Code 4901:1-10-10(B) also provides guidance regarding the
5		filing requirements. The application is to include supporting justification for the
6		proposed methodology and each resulting performance standard. The
7		performance standards should reflect historical system performance, system
8		design, technological advancements, service area geography, customer perception
9		surveys, and other relevant factors.
10		The process concludes with a Commission order, thus establishing minimum
11		reliability performance standards for the electric utility.
12		
13	14.	Q. What is Staff's role in the standard setting process?
14		A. Staff evaluates the application, submits data requests to the EDU as needed,
15		and files comments. Staff also works with the EDU and other interested parties in
16		an attempt to come to a consensus on what the performance standards should be,
17		taking into consideration input from all parties involved.
18		

19 15. Q. When were the standards currently in place established?

1		A. On September 17, 2014, the Commission established standards that became
2		effective for performance in calendar years 2015 and 2016 ¹ . In Case No. 16-1602-
3		EL-ESS, the Company filed an application to revise standards beginning with
4		calendar year 2017 ² . As that case is currently open, the attorney examiner stated
5		in an Entry that the standards approved for 2016 should remain in effect until such
6		time that the Commission orders otherwise ³ . The Stipulation and
7		Recommendation (Stipulation) filed in this case includes provisions to establish
8		standards for 2018 through 2025^4 .
9		
10	16.	Q. Has the Company met its approved reliability standards in recent years?
11		A. The Company met both its CAIDI and SAIFI standards for 2015, missed its
12		CAIDI standard for 2016, and missed both standards in 2017.
13		Ohio Adm.Code 4901:10-10(C) requires each electric utility to file an annual
14		report of reliability performance and supporting data. The following tables detail
15		the Company's reliability performance compared to its standards for each of the
16		last five years through 2017, which was the most recent performance data

¹ In the Matter of the Application of Duke Energy Ohio, Inc., for Approval of Proposed Reliability Standards, Case No. 13-1539-EL-ESS, Opinion and Order (Sept. 17, 2014).

² In the Matter of the Application of Duke Energy Ohio, Inc., to Establish Minimum Reliability Performance Standards, Case No. 16-1602-EL-ESS, Application (July 22, 2016) (Duke ESS Case).

³ Duke ESS Case, Attorney Examiner Entry at 2 (Sept. 18, 2017).

⁴ See 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 at 13 (April 13, 2018) (Duke Global Case).

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CAIDI Performance vs. Standard (Lower is Better)

YEAR	PERFORMANCE	STANDARD
2017*	127.28	122.81
2016*	136.42	122.81
2015	117.32	122.81
2014	108.28	121.25
2013	117.80	118.14
	4	1

*denotes missed standard

SAIFI Performance vs. Standard

YEAR	PERFORMANCE	STANDARD
2017*	1.16	1.05
2016	1.05	1.05
2015	1.04	1.05
2014	0.99	1.17
2013	0.98	1.24
	*(denotes missed standard

9

10

11 17. Q. Please describe the means by which the Company evaluates its customers'

12 reliability expectations.

A. Ohio Adm.Code 4901:1-10-10(B)(4)(b) requires each electric utility to

14 periodically (no less than every three years) conduct a customer perception survey

- 15 under Staff oversight. Staff oversight includes ensuring that certain questions are
- included and that the surveys are conducted over four quarters to avoid seasonal

⁵ See the Annual Reports filed by Duke Energy Ohio in Case Nos. 14-493-EL-ESS, 15-581-EL-ESS, 16-288-EL-ESS, 17-760-EL-ESS, 18-994-EL-ESS.

1		bias.
2		
3	18.	Q. When did the Company last conduct a customer perception survey?
4		A. The Company's last customer perception survey was conducted in the 2 nd , 3 rd ,
5		and 4 th quarters of 2015, and the 1 st and 2 nd quarters of 2016. The results were
6		provided to Staff on September 6, 2016 and are attached as JN-1 and JN-2.
7		
8	19.	Q. According to Staff's analysis of the survey results, are Duke's customers'
9		expectations currently being met with respect to SAIFI performance?
10		A. Yes. On average, customers state that less than 1.2 interruptions per customer
11		served is acceptable in a year. This is exceeded by Duke's SAIFI performance in
12		each of the last five years.
13		
14	20.	Q. According to Staff's analysis of the survey results, are Duke's customers'
15		expectations currently being met with respect to CAIDI performance?
16		A. Yes. On average, customers state that restoration time of less than
17		approximately four hours is acceptable. This is exceeded by Duke's CAIDI
18		performance in each of the last five years.

1

2	21.	Q. In general, what are Duke's customers' expectations regarding reliability?			
3		A. Duke's customers have increasing expectations of reliability. That is, they			
4		expect reliability to improve.			
5					
6	22.	Q. What standards has Duke committed to going forward?			
7	A. Per the Stipulation and Recommendation filed in this case on April 13, 2018				
8	8 Duke commits to the following reliability standards through 2025:				

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	127.00	0.75
2025	137.00	0.75

9

10 23. Q. Duke's currently-approved CAIDI standard is 122.81. Per the Stipulation, the

11 CAIDI standard increases initially to 134.34, 135.52, and then 137.00. Does an

12 increasing CAIDI not represent worsening reliability performance?

A. When examined in insolation, it may. However, Duke has also committed to a
reduced SAIFI standard, which will result in improved overall system reliability.

15

1 24. Q. Please explain.

2		A. A decreasing SAIFI indicates that fewer customers experience an outage.
3		Because CAIDI is calculated by dividing total outage time, the numerator, by the
4		number of customers who experience an outage, the denominator, an increase in
5		CAIDI can be the mathematical result of a lower denominator, or fewer customers
6		experiencing an outage. Therefore, Staff also evaluates SAIDI, which is more
7		representative of average outage duration across all customers in the service
8		territory.
9		
10	25.	Q. Provided that Duke meets the standards it has committed to in this case for
11		2018 through 2025, what will be the impact to SAIDI?
12		A. The combination of Duke's CAIDI and SAIFI commitments results in SAIDI
13		that improves each of the next four years, and in 2022 through 2025 will be the
14		lowest it has been since the EDUs began to report reliability performance in 2010.
15		If Duke exceeds either its CAIDI or SAIFI standards, the resulting SAIDI will be
16		even lower. Therefore, on a system-wide basis, Duke's customers will experience
17		improved reliability.
18		The table below illustrates Duke's SAIDI performance for each of the last five
19		vears, and SAIDI commitments for the next eight years
17		jeas, and stribt communicates for the next eight years.

20

YEAR	SAIDI PERFORMANCE	SAIDI COMMITMENT
2013	115.44	
2014	107.20	
2015	122.01	
2016	143.24	
2017	147.64	
2018		150.46
2019		134.34
2020		122.25
2021		112.48
2022 through 2025		102.75

2

Q. Please summarize how Duke's reliability commitments in this case are aligned
with the expectations of its customers.

A. Duke has committed to a nearly 30% reduction in SAIFI, which translates to 5 6 30% fewer customers who will experience an outage at all. CAIDI is increasing about 12%, but this is not necessarily indicative of worsening reliability. As I 7 stated earlier, the combination of Duke's SAIFI and CAIDI commitments results 8 in SAIDI that improves each of the next four years. In years 2022 through 2025, 9 Duke's customers system-wide will experience a 30% improvement in overall 10 reliability when compared to 2017 performance. 11 Staff believes that Duke's commitment to improved reliability aligns the 12 Company's and its customers' expectations. 13

2	27.	Q. Please summarize how Duke's reliability commitments in this case allow the
3		Commission to ensure that Duke is placing sufficient emphasis on and dedicating
4		sufficient resources to the reliability of its distribution system.
5		A. Duke has committed to reliability standards as part of a stipulated agreement
6		negotiated in good faith. It is Staff's expectation that by doing so, Duke intends to
7		place sufficient emphasis on and dedicate sufficient resources to meeting those
8		standards for the duration of the ESP.
9		
10	28.	Q. Does this conclude your testimony?
11		A. Yes, it does.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the Pre-filed Testimony in Support of the Stipulation of Jacob J. Nicodemus has been served upon the below-named counsel via electronic mail, this 25th day of June, 2018.

<u>/s/ Steven L. Beeler</u> Steven L. Beeler

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Q2-16 Ohio PUC Reliability Study Business Results

July 2016 <u>Prepared by</u>: Cindy Linker, Duke Energy CSAT Team

Completed Survey Counts

• Telephone survey conducted with a random sample of Ohio Business customers

	Q2-15	Q3-15	Q4-15	Q1-16	Q2-16
Completed Telephone Surveys	100	100	100	100	100
Total Completed Surveys	100	100	100	100	100



Reliability Quarterly Results



How many brief interruptions of <u>5 minutes or less</u> would you consider *acceptable* during a 12 month period?



$\blacksquare 0 \blacksquare 1 \blacksquare 2 \blacksquare 3 \blacksquare 4 \blacksquare 5 \blacksquare 6+$

How many brief interruptions of <u>5 minutes or less</u> have you experienced at your business in the past 12 months?

$\blacksquare 0 \blacksquare 1 \blacksquare 2 \blacksquare 3 \blacksquare 4 \blacksquare 5 \blacksquare 6+$

How many lengthy interruptions of <u>more than 5 minutes</u> would you consider *acceptable* during a 12 month period?

$\blacksquare 0 \blacksquare 1 \blacksquare 2 \blacksquare 3 \blacksquare 4 \blacksquare 5 \blacksquare 6+$

How many lengthy interruptions of <u>more than 5 minutes</u> have you experienced at your business in the past 12 months?

$\blacksquare 0 \blacksquare 1 \blacksquare 2 \blacksquare 3 \blacksquare 4 \blacksquare 5 \blacksquare 6+$

Q2-16 OH PUC Business Reliability Study

Would you estimate your longest power outage in the past 12 months to be:

Not aware of any power outage in the past 12 month
 Five minutes to less than one hour
 Five hours to less than 24 hours

24 hours or more

What do you consider to be an acceptable length of a prolonged outage that was <u>not</u> storm related?

Less than thirty minutes
 More than an hour but less than two hours
 More than four hours

More than thirty minutes but less than an hour
 More than two hours but less than four hours

What do you consider to be an acceptable length of a prolonged outage that was storm related?

Less than thirty minutes

More than an hour but less than two hours

More than six hours but less than twelve hours

More than twenty-four hours

- More than thirty minutes but less than an hour
- More than two hours but less than six hours
- More than twelve hours but less than twenty-four hours

Demand Response Quarterly Results

During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>1 hour</u> electric service outage to your business?

During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>2 hour</u> electric service outage to your business?

During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>4 hour</u> electric service outage to your business?

How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your business for <u>1 hour</u>?

How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your business for <u>2 hours</u>?

How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your business for <u>4 hours</u>?

How much of a credit to your electric bill would you require from the utility to allow the electric company to control the usage of certain electrical equipment within your business during a time when its system is under stress?

During a time when your electric company's system is under stress and the company calls on its customers to conserve electric, would you be willing to take measures to conserve your business's electric usage?

In helping with your energy conservation, would you be interested in new technology that lets you automate the settings for different electrical equipment to reduce electricity use when the cost to produce and deliver electricity is high?

Reliability Rolling 4-Quarter Average Results
How many brief interruptions of <u>5 minutes or less</u> would you consider *acceptable* during a 12 month period?





How many brief interruptions of <u>5 minutes or less</u> have you experienced at your business in the past 12 months?





How many lengthy interruptions of <u>more than 5 minutes</u> would you consider *acceptable* during a 12 month period?





How many lengthy interruptions of <u>more than 5 minutes</u> have you experienced at your business in the past 12 months?



0 1 2 3 4 5 6+



Q2-16 OH PUC Business Reliability Study

Would you estimate your longest power outage in the past 12 months to be:

Not aware of any power outage in the past 12 month
Five minutes to less than one hour
Five hours to less than 24 hours









What do you consider to be an acceptable length of a prolonged outage that was <u>not</u> storm related?

Less than thirty minutes
More than an hour but less than two hours
More than four hours

More than thirty minutes but less than an hour
More than two hours but less than four hours





What do you consider to be an acceptable length of a prolonged outage that was storm related?

Less than thirty minutes

- More than an hour but less than two hours
- More than six hours but less than twelve hours
- More than twenty-four hours

- More than thirty minutes but less than an hour
- More than two hours but less than six hours
- More than twelve hours but less than twenty-four hours









Q2-16 Ohio PUC Reliability Study Residential Results

June 2016 <u>Prepared by</u>: Cindy Linker, Duke Energy CSAT Team

Completed Survey Counts

- Online survey emailed to a random sample of residential customers
- Email invitations mailed in Waves

	Q2-15	Q3-15	Q4-15	Q1-16	Q2-16
Sample Size	1998	1762	1500	2000	2000
Completed Surveys	108	110	118	103	127
Response Rate	5%	6%	8%	5%	6%



Reliability Quarterly Results

How many brief interruptions of <u>5 minutes or less</u> would you consider *acceptable* during a 12 month period?





How many brief interruptions of <u>5 minutes or less</u> have you experienced at your home in the past 12 months?





How many lengthy interruptions of <u>more than 5 minutes</u> would you consider *acceptable* during a 12 month period?





How many lengthy interruptions of <u>more than 5 minutes</u> have you experienced at your home in the past 12 months?





Would you estimate your longest power outage in the past 12 months to be:





What do you consider to be an acceptable length of a prolonged outage that was <u>not</u> storm related?





What do you consider to be an acceptable length of a prolonged outage that <u>was</u> storm related?



More than an hour but less than two hours

More than six hours but less than twelve hours

More than twenty-four hours

- More than thirty minutes but less than an hour
- More than two hours but less than six hours
- More than twelve hours but less than twenty-four hours





Demand Response Quarterly Results

During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>1 hour</u> electric service outage to your residence?





During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>2 hour</u> electric service outage to your residence?





During a specified period of system stress, such as a hot summer day, what is the maximum amount that you would be willing to pay and have included in your electric bill in order to avoid a <u>4 hour</u> electric service outage to your residence?





How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your residence for <u>1 hour</u>?





How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your residence for <u>2 hours</u>?





How much of a credit to your electric bill would you require from the utility to allow the electric company to interrupt service to your residence for <u>4 hours</u>?





How much of a credit to your electric bill would you require from the utility to allow the electric company to control the operation of the <u>hot water heater</u> within your residence during a time when its system is under stress?





How much of a credit to your electric bill would you require from the utility to allow the electric company to control the operation of the <u>air conditioning</u> within your residence during a time when its system is under stress?





During a time when your electric company's system is under stress and the company calls on its customers to conserve electric, would you be willing to take measures to conserve your household electric usage?





Q2-16 OH PUC Residential Reliability Study

In helping with your energy conservation, would you be interested in new technology that lets you automate the settings for air conditioning or different appliances to reduce electricity use when the cost to produce and deliver electricity is high?





Reliability Rolling 4-Quarter Average Results

How many brief interruptions of <u>5 minutes or less</u> would you consider *acceptable* during a 12 month period?





How many brief interruptions of <u>5 minutes or less</u> have you experienced at your home in the past 12 months?





How many lengthy interruptions of <u>more than 5 minutes</u> would you consider *acceptable* during a 12 month period?





How many lengthy interruptions of <u>more than 5 minutes</u> have you experienced at your home in the past 12 months?





Would you estimate your longest power outage in the past 12 months to be:





What do you consider to be an acceptable length of a prolonged outage that was <u>not</u> storm related?

Less than thirty minutes
More than an hour but less than two hours
More than four hours

More than thirty minutes but less than an hour
More than two hours but less than four hours




What do you consider to be an acceptable length of a prolonged outage that was storm related?

Less than thirty minutes

- More than an hour but less than two hours
- More than six hours but less than twelve hours
- More than twenty-four hours

- More than thirty minutes but less than an hour
- More than two hours but less than six hours
- More than twelve hours but less than twenty-four hours







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Case No(s). 17-0032-EL-AIR, 17-0033-EL-ATA, 17-0034-EL-AAM, 17-0872-EL-RDR, 17-0873-EL-ATA, 7

Summary: Testimony in Support of the Stipulation of Jacob J. Nicodemus electronically filed by Ms. Tonnetta Scott on behalf of PUC