

**BEFORE  
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Filing by Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company of a Grid Modernization Business Plan	)	
	)	
	)	Case No. 16-481-EL-UNC
	)	
	)	
In the Matter of the Filing by Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company Application for Approval of a Distribution Platform Modernization Plan	)	
	)	
	)	Case No. 17-2436-EL-UNC
	)	
	)	
	)	
In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company to Implement Matters Relating to the Tax Cuts and Jobs Act of 2017	)	
	)	
	)	Case No. 18-1604-EL-UNC
	)	
	)	
	)	
In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company for Approval of a Tariff Change	)	
	)	
	)	Case No. 18-1656-EL-ATA
	)	

**DIRECT TESTIMONY OF CURT VOLKMANN  
ON BEHALF OF  
ENVIRONMENTAL LAW & POLICY CENTER,  
NATURAL RESOURCES DEFENSE COUNCIL, AND  
OHIO ENVIRONMENTAL COUNCIL**

**PUBLIC REDACTED VERSION**

January 17, 2019

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1    **1. Introduction**

2    **Q.     Please state your name and business address.**

3    A.     My name is Curt Volkmann. My business address is 736 N. Western Avenue  
4            #115, Lake Forest, Illinois, 60045.

5    **Q.     On whose behalf are you submitting this direct testimony?**

6    A.     I am submitting this testimony on behalf of the Environmental Law & Policy  
7            Center (“ELPC”).

8    **Q.     By whom are you employed and in what capacity?**

9    A.     I am President and founder of New Energy Advisors, LLC, an independent  
10           consulting firm. I work with environmental and consumer advocates in a  
11           variety of regulatory proceedings related to distribution system planning,  
12           distributed energy resources, and grid modernization.

13   **Q.     Please summarize your education and professional experience.**

14   A.     I have a BS in Electrical Engineering from the University of Illinois with a  
15           concentration in Electrical Power Systems. I also have an MBA from the  
16           University of California at Berkeley with a concentration in Finance. I have  
17           34 years of experience in the utilities industry, primarily in electric  
18           transmission and distribution. My work experience includes nine years at  
19           Pacific Gas & Electric in various transmission and distribution engineering  
20           roles, and eighteen years at Accenture with several positions including  
21           Executive Director in the North American Utilities practice. Since 2015, I  
22           have worked independently and supported clients in evaluating utility grid  
23           modernization plans in California, Iowa, Minnesota, Michigan, and North  
24           Carolina. Exhibit CV-1 provides a statement of my qualifications and  
25           experience.

1   **Q.    Have you previously testified before the Public Utilities Commission of**  
2       **Ohio (the “Commission” or “PUCO”)?**

3    A.    No.

4   **Q.    Have you previously participated in proceedings led by the PUCO?**

5    A.    Yes, I participated in a PowerForward Distribution Planning panel on March  
6       6, 2018. I also authored a whitepaper on Integrated Distribution Planning with  
7       specific recommendations for the Commission to consider. Many of these  
8       recommendations are included in the recently published PUCO report  
9       *PowerForward: A Roadmap to Ohio's Electricity Future* (“PowerForward  
10      Roadmap”).

11   **Q.    Have you previously testified or filed comments before other regulatory**  
12       **commissions?**

13   A.    Yes. I have testified and commented before regulatory commissions in eight  
14       states. Exhibit CV-2 provides a summary of my prior testimony and  
15       contributions to comments.

16   **2. Purpose of Testimony, Summary of Concerns and**  
17       **Recommendations**

18   **Q.    What is the purpose of your testimony in this proceeding?**

19   A.    In my testimony, I raise questions and concerns about the November 9, 2018  
20       Stipulation and Recommendation (“Stipulation”) filed by Ohio Edison  
21       Company, The Cleveland Electric Illuminating Company and The Toledo  
22       Edison Company (the “Companies”). I specifically focus on the Cost-Benefit  
23       Analysis (“CBA”) for the Companies’ phase one grid modernization plan  
24       (“Grid Mod 1”). I also make recommendations for changes to Grid Mod 1 to  
25       ensure the realization of customer benefits.

1     **Q.     Please summarize your concerns and recommendations.**

2     A.     Since early November 2018, the review and approval process for the  
3             Stipulation has been rushed and opaque. The Companies have not been  
4             willing to engage to discuss our questions and concerns about the data and  
5             assumptions in the CBA. I'm not convinced that the Grid Mod 1 "benefits ...  
6             exceed costs on a net present value basis"<sup>1</sup> as required by the PowerForward  
7             Roadmap.

8             I recommend that the PUCO:

- 9             • Delay approval of the Stipulation until questions are answered and  
10            Staff and stakeholders fully understand the Grid Mod 1 CBA. The  
11            questions I raise in my testimony are related to the validity of the  
12            underlying data and assumptions used by the Companies in the CBA.
- 13            • Require the Companies to modify the Grid Mod I scope to include  
14            investments in the deployment of enabling technologies, specifically  
15            smart thermostats, in conjunction with the AMI deployment. This  
16            should include sufficient budget for customer communications and  
17            education to achieve the Companies' targeted 10% Customer Energy  
18            Management participation rate beginning in Year 2.
- 19            • Require Staff or the consultant to include in the mid-period Grid Mod  
20            1 assessment/audit a review of all CBA Benefits from Grid Mod 1(not  
21            just operational savings), including customer energy savings, peak  
22            demand reductions, and reliability improvements.
- 23            • Require the Companies to revise their reliability performance  
24            standards under OAC 4901:1-10-10(B)(7) consistent with the expected  
25            reliability improvements in the CBA.
- 26            • Require the Companies to establish a performance metric specifically  
27            for DA reliability improvements during major storms/events. The

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<sup>1</sup> *PowerForward: A Roadmap to Ohio's Electricity Future* (Aug. 29, 2018) at 27.

1 Commission should also set a performance target that aligns with the  
2 expected reliability improvement during major storms/events in the  
3 CBA and establish rewards and penalties based on the Companies'  
4 ability to achieve the target.

5 **3. The Commission Has Established Criteria for**  
6 **Evaluating Stipulations**

7 **Q. What are the Commission's criteria for considering the reasonableness**  
8 **of a Stipulation?**

9 A. The Commission has used the following criteria<sup>2</sup>:

- 10 1) Is the settlement a product of serious bargaining among capable,  
11 knowledgeable parties?  
12 2) Does the settlement, as a package, benefit ratepayers and the public  
13 interest?  
14 3) Does the settlement package violate any important regulatory principle  
15 or practice?

16 **Q. What is your assessment of the Stipulation's compliance with the**  
17 **criteria?**

18 A. I am not an attorney and have not analyzed the Stipulation to determine  
19 compliance with the criteria. However, I believe the Companies have failed  
20 to credibly demonstrate that Grid Mod 1, as a package, delivers net benefits  
21 to ratepayers.

22 **4. PowerForward Calls for a Transparent Cost-Benefit**  
23 **Analysis (CBA)**

24 **Q. Why is a transparent CBA important?**

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<sup>2</sup> *In re Application of Ohio Power Company*, Case Nos. 16-1852-EL-SSO *et al.*, Opinion and Order (Apr. 25, 2018) at 49.

1 A. The PUCO's PowerForward Roadmap states, "... in requests for grid  
2 modernization investment, it only makes sense that an EDU include a  
3 cost/benefit analysis with the application. This way, the Commission and  
4 stakeholders can transparently evaluate whether a grid modernization  
5 investment should be made in the first place. Applications for investment  
6 should demonstrate that benefits generated by the project will exceed costs  
7 on a net present value basis."<sup>3</sup>

8 Since the Companies' proposed Grid Mod 1 is the first grid modernization  
9 plan before the Commission after the completion of PowerForward, it's the  
10 first opportunity for the PUCO to set the tone for how it will evaluate EDU  
11 grid modernization plans going forward. I therefore believe it is important  
12 that the Companies' CBA be transparent, credible and fully understood by the  
13 Commission, Staff and stakeholders.

## 14 **5. The Companies' CBA for Grid Mod 1 is Flawed**

15 **Q. What is the Companies' proposed scope of Grid Mod 1?**

16 A. Grid Mod 1 as described in the Stipulation consists of Advanced Metering  
17 Infrastructure ("AMI") including the installation of 700,000 smart meters and  
18 the necessary supporting communications infrastructure, a MeterData  
19 Management System ("MDMS"), Distribution Automation ("DA") on at least  
20 200 circuits, Integrated Volt-VAR Control ("IVVC") on at least 202 circuits,  
21 an Advanced Distribution Management System ("ADMS"), and Platform.

22 **Q. What is Distribution Automation or DA?**

23 A. According to the Companies' 2016 Grid Modernization BusinessPlan:

24 DA focuses on improved reliability and is comprised of  
25 substation equipment, circuit reclosers, and wireless  
26 communications infrastructure. Fault Isolation Service  
27 Restoration ("FISR") is a distribution automation

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<sup>3</sup> *PowerForward: A Roadmap to Ohio's Electricity Future*, p. 27.

1 application that runs a series of algorithms to determine the  
2 optimal operation of reclosers on a feeder so as to minimize  
3 both the duration as well as the number of customers affected  
4 by a power outage. This technology can be used to open and  
5 close reclosers to connect and disconnect certain portions of  
6 the grid as the real time operating conditions warrant.  
7 Particularly applicable to service outage situations, this  
8 technology provides the capability to automatically  
9 maximize the restoration of power from momentary  
10 abnormal conditions, minimize sustained customer outages  
11 as well as support FISR.<sup>4</sup>

12 **Q. What is Platform?**

13 A. My understanding is that Platform refers to investments the Companies first  
14 proposed in their Distribution Platform Modernization (“DPM”) Plan, filed  
15 in Case No. 17-2436-EL-UNC. I understand these investments may include  
16 new circuit tie miles, reconductoring, new reclosers, and SCADA devices on  
17 substations and circuits.<sup>5</sup> The Companies have not provided additional details  
18 regarding the substance of the proposed Platform investments.<sup>6</sup>

19 **Q. Are you opposed to the proposed elements of Grid Mod 1?**

20 A. Other than Platform and the recommended revisions I describe later in my  
21 testimony, I am not opposed to the proposed elements of Grid Mod 1. My  
22 concerns are related to the CBA and the extent to which the benefits of Grid  
23 Mod 1 exceed the costs, as required by the Commission’s PowerForward  
24 Roadmap.

25 **Q. How have the Companies developed the CBA for Grid Mod 1?**

26 A. The Companies have combined the Grid Mod 1 capital costs, incremental  
27 O&M, operational savings, and customer/societal benefits (“Benefits”) in the

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<sup>4</sup> Case No. 16-0481-EL-UNC, Grid Modernization Business Plan (Feb. 29, 2016), Appendix A, p. 11.

<sup>5</sup> Stipulation, p. 25.

<sup>6</sup> Companies’ Response to ELPC Set 6 Interrogatory 4 (attached in Exhibit CV-3).



1 CBA. The Companies attribute the Benefits to four elements of Grid Mod 1,  
2 specifically AMI, DA, IVVC, and Platform.

3 **Q. What are some examples of the Benefits in the CBA?**

4 A. The Benefits include reduced customer energy consumption; reduced CO<sub>2</sub>  
5 emissions; reduced electricity theft and increased meter accuracy; avoided  
6 generation, transmission and distribution capacity costs; and improved  
7 reliability during major storms/events<sup>7</sup> and during normal weather events.

8 **Q. What are the results of the Companies' CBA?**

9 A. The Companies are claiming \$808 million of benefits and \$574 million of  
10 costs for a Benefit-to-Cost ratio of 1.4 on a net present value ("NPV") basis.  
11 The Companies' CBA is summarized in Attachment B of the Stipulation and  
12 shown below.

#### Attachment B: Cost-Benefit Analysis

Total Project: Grid Mod I		
(\$ in millions)	Nominal	NPV
Estimated Benefits	\$ (1,782)	\$ (808)
Estimated Costs		
Capital	\$ 516	\$ 445
Incremental O&M	\$ 342	\$ 207
Operational Savings	\$ (175)	\$ (78)
Total	\$ 683	\$ 574
Net Benefits	\$ 1,098	\$ 234
Benefit-to-Cost Ratio	2.6	1.4

13

14 **Q. What do you consider to be potential flaws in the Grid Mod 1CBA?**

15 A. When I first reviewed the Stipulation and Attachment B, I immediately  
16 focused on the \$1,782 million nominal and \$808 million NPV of Benefits.  
17 For the relatively modest scope of Grid Mod 1, the magnitude of these

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<sup>7</sup> Major storms/events are defined in Ohio Administrative Code 4901:1-10-01(T).

1 Benefits is not credible. After reviewing the Companies' responses to data  
2 requests with further detail on the CBA, I found flawed data and assumptions  
3 in the underlying analysis.

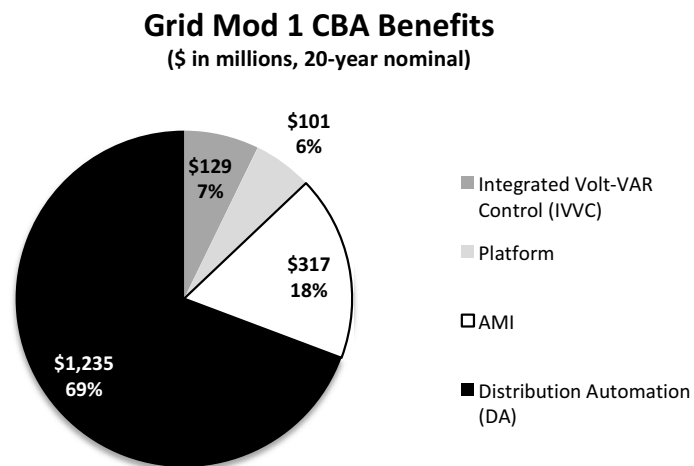
4 **Q. Have you communicated with the Companies about your concerns?**

5 A. We have tried unsuccessfully to engage with the Companies to discuss our  
6 concerns. We have submitted several data requests that clearly identify our  
7 questions regarding the CBA to which the Companies have provided  
8 unhelpful responses.

9 **1) The Benefits for DA in the Companies' CBA are Based on Flawed**  
10 **Data**

11 **Q. Which Grid Mod 1 program is contributing the most Benefits?**

12 A. The Companies attribute \$1,235 million (20 year nominal) or 69% of the total  
13 nominal Benefits to Distribution Automation or DA. The diagram below  
14 shows the sources of Benefits in the Companies' Grid Mod 1 CBA.



15

16 Of the \$1,235 million of DA Benefits, the Companies attribute \$803 million  
17 (45% of the total Benefits) to improved reliability from DA during major

1 storms/events, and \$432 million (24% of the total Benefits) to improved  
2 reliability from DA excluding major storms/events.<sup>8</sup>

3 **Q. Is it credible that reliability benefits from DA during major**  
4 **storms/events would be nearly double the benefits during non-major**  
5 **storm/events?**

6 A. No. It is counter-intuitive to me that reliability improvements from DA would  
7 be significantly higher during major storms/events. As the Companies  
8 explained in their 2016 Grid Modernization Business Plan, the reliability  
9 benefits from DA result from the ability to automatically isolate faulted  
10 portions of a circuit and to quickly re-energize other customers by transferring  
11 them to adjacent circuits that are operating normally.<sup>9</sup> These transfers of  
12 customers require that the adjacent circuits are operational and have sufficient  
13 capacity to serve the additional customer load.

14 During major storms/events when there is widespread system damage with  
15 multiple circuits impacted, the ability of DA to successfully transfer  
16 customers, restore service, and improve reliability is significantly impaired.

17 **Q. How have the Companies quantified the value of improved reliability?**

18 A. The Companies have used the Department of Energy's Interruption Cost  
19 Estimate ("ICE") Calculator<sup>10</sup> to convert expected reliability improvements  
20 into economic benefits for customers.

21 **Q. Is using the ICE Calculator a valid analysis?**

22 A. I have seen other utilities use the ICE Calculator as a basis for justifying the  
23 cost effectiveness of proposed grid modernization programs. Some of these

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<sup>8</sup> Source: 'ELPC Set 2-RPD-002 Attachment 1 Confidential.xlsx' (attached in Exhibit CV-3).

<sup>9</sup> Case No. 16-0481-EL-UNC, Grid Modernization Business Plan (Feb. 29, 2016), Ex. A, p. 28.

<sup>10</sup> Lawrence Berkeley National Laboratory, Interruption Cost Estimate Calculator, <https://eaei.lbl.gov/tool/interruption-cost-estimate-calculator>.

1 justifications have been credible and others have not. The validity of the ICE  
2 Calculator output is only as good as the validity of the input data. If the input  
3 data is not credible, the ICE output is not credible – it can be the classic case  
4 of garbage in, garbage out.

5 **Q. What input data is required for the ICE Calculator?**

6 A. There are several variables required as inputs to the ICE Calculator including  
7 the number of customers by type, their average electricity usage, and  
8 historical or baseline reliability as measured by SAIDI, SAIFI and CAIDI.<sup>11</sup>  
9 Another critical input to the ICE Calculator is the expected reliability  
10 improvement from the planned grid modernization program.

11 **Q. What assumptions have the Companies made about the expected  
12 reliability improvement from Grid Mod 1?**

13 A. The Companies have assumed reliability improvements for both Platform and  
14 DA as summarized in Table 1 below.<sup>12</sup>

	Expected Improvement	
	SAIDI	SAIFI
Platform	15%	6%
DA - major storms/events	46%	40%
DA - excluding major storms/events	28%	9%

15 **Table 1**

16 **Q. Are these assumptions for reliability improvement credible?**

17 A. I've not reviewed the supporting analysis for Platform but improvements of  
18 15% for SAIDI and 6% for SAIFI seem reasonable. The expected reliability

---

<sup>11</sup> SAIDI = System Average Interruption Duration Index measured in minutes per customer; SAIFI = System Average Interruption Frequency Index measured in interruptions per customer; CAIDI = Customer Average Interruption Duration Index measured in minutes per interruption. The mathematical relationship is  $CAIDI = SAIDI / SAIFI$ .

<sup>12</sup> Sources: 'ELPC Set 2-RPD-003 Attachment 7 Confidential.xlsx', 'ELPC Set 2-RPD-003 Attachment 8 Confidential.xlsx', and 'ELPC Set 2-RPD-002 Attachment 1 Confidential.xlsx' (attached in Exhibit CV-3).

1 improvements from DA are not credible, particularly during major  
2 storms/events. As I previously described, the automatic reconfiguration of  
3 circuits to restore customers with DA is significantly less effective when there  
4 is widespread damage during a major storm/event with multiple circuits  
5 impacted.

6 The Companies' own Grid Modernization Business Plan fails to support these  
7 values stating, "Depending on the number of circuits deployed with DA  
8 technology, the reliability improvement could be as much as 24 percent."<sup>13</sup>

9 **Q. How did the Companies determine these values for expected reliability**  
10 **improvement from DA?**

11 A. The Companies relied on historical outage data from 34 circuits in the  
12 Cleveland area that were part of the Smart Grid Modernization Initiative  
13 ("SGMI"). I understand that circuits in this area had circuit ties, reclosers, and  
14 SCADA as part of SGMI beginning in 2012.<sup>14</sup> My understanding is that the  
15 Companies believe the historical restoration data on these circuits are  
16 reasonable proxies for the performance of circuits included in Grid Mod 1.

17 **Q. How have the Companies used the data from the SGMI circuits?**

18 A. The Companies compared the SGMI circuits' 2005-2009 5-year average  
19 SAIDI and SAIFI ("Before Grid Mod") with the June 2014 – May 2018 4-  
20 year average SAIDI and SAIFI ("After Grid Mod"). The Companies made  
21 the reliability comparisons for outages during major storms/events and  
22 excluding major storms/events.

23 **Q. Do you agree with this approach?**

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<sup>13</sup> Case No. 16-0481-EL-UNC, Grid Modernization Business Plan (Feb. 29, 2016), Exhibit A, p. 28.

<sup>14</sup> See Case No. 17-2436-EL-UNC, Direct Testimony of William Beutler (Dec. 1, 2017) at 4:4-5.

1 A. I understand the logic behind the comparison, but I have concerns that the  
2 underlying outage data in the reliability calculations is flawed and inflates the  
3 expected reliability improvements from DA.

4 **Q. Specifically what outage data is flawed?**

5 A. There was a major outage event on July 31, 2006 at 5:10 pm that resulted in  
6 [REDACTED] customer-minutes interrupted. The outage records for this event  
7 are double-counted in both the analysis excluding major storms/events and  
8 the analysis during major storms/events. These outage records should be in  
9 one analysis or the other, not both.

10 **Q. Are there other questionable records in the outage data?**

11 A. Yes, a major outage on April 25, 2005 at 4:10 am resulting in [REDACTED]  
12 customer-minutes interrupted is triple-counted. There are three outage  
13 records for this event with the exact same circuit, start date/time, restoration  
14 date/time, cause, customer-minutes, and customers interrupted.

15 **Q. Have the Companies confirmed or denied that there are errors in the**  
16 **data?**

17 A. We submitted specific data requests about these errors and the Companies  
18 merely provided the terse and unhelpful response, "See Case No.09-1821-  
19 EL-GRD".<sup>15</sup> After following up with an additional data request, the  
20 Companies provided their annual interim report on the results of DA and  
21 IVVC studies for the period ending May 31, 2018.<sup>16</sup> The report merely  
22 repeats the values in Table 1 above and does not address our questions about  
23 errors in the data. With respect to the apparently triple-counted entries from  
24 April 25, 2005, the Companies merely asserted in a subsequent supplemental  
25 response that "[t]he information on the referenced rows is what is currently

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<sup>15</sup> Companies' Responses to ELPC Set 5-INT-005(a) and ELPC Set 5-INT-006(b) (attached in Exhibit CV-3).

<sup>16</sup> Companies' Response to ELPC Set 5-INT-005, Attachment 1 (attached in Exhibit CV-3).

1 available in the Companies' historic records and further details are not  
2 available."<sup>17</sup>

3 **Q. What are the expected reliability improvements after eliminating the**  
4 **duplicate data?**

5 A. After removing the duplicate 4/25/2005 outage records from the major  
6 storms/events data and the duplicate 7/31/2006 outage records from the data  
7 excluding major storms/events, the revised reliability improvements from DA  
8 are shown in Table 2 below.<sup>18</sup>

	Expected Improvement	
	SAIDI	SAIFI
Platform	15%	6%
DA - major storms/events	<del>46%</del> 44%	<del>40%</del> 39%
DA - excluding major storms/events	<del>28%</del> 16%	<del>9%</del> 8%

9 **Table 2**

10 **Q. Do you have other concerns about the analysis of expected reliability**  
11 **improvement from DA?**

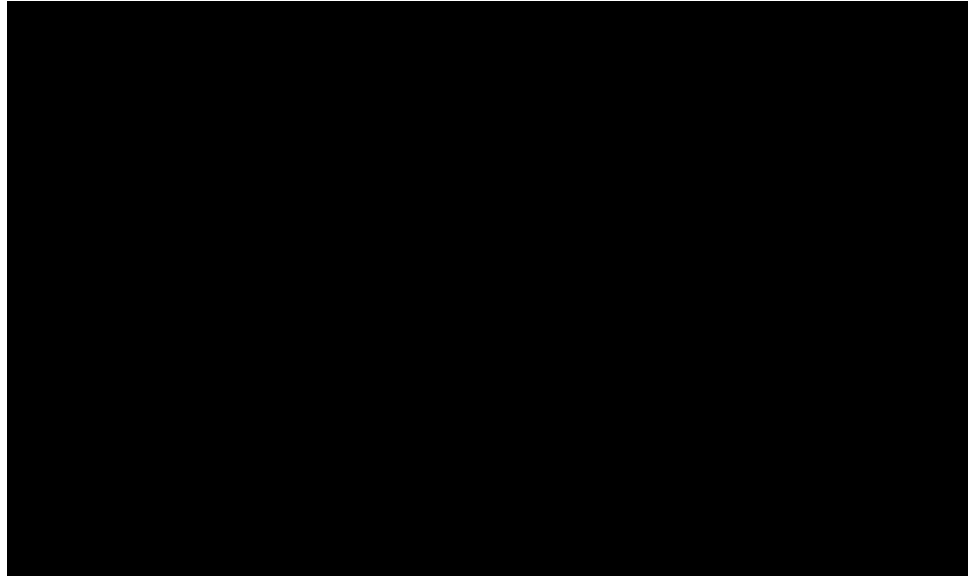
12 A. Yes, I believe the Companies have included outlier data in the analysis that is  
13 skewing the calculation of averages and inflating the expected reliability  
14 improvements from DA during major storms/events. Figure 1 below shows  
15 the 2005-2009 customer-minutes interrupted during major storms/events by  
16 month used by the Companies in the "Before Grid Mod" analysis of the SGMI  
17 circuits.<sup>19</sup>

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<sup>17</sup> Companies' Response to ELPC Set 7-INT-3 Confidential (attached in Exhibit CV-3).

<sup>18</sup> See 'WP ELPC Set 2-RPD-003 Attachment 7 Confidential #1.xlsx' and 'WP ELPC Set 2-RPD-003 Attachment 8 Confidential #1.xlsx.'

<sup>19</sup> Source: 'ELPC Set 2-RPD-003 Attachment 8 Confidential.xlsx' (attached in Exhibit CV-3).



**Figure 1**

1

2       There were 15 months with major events/storms over this period. Note that  
3       there were no major storms/events in 2007<sup>20</sup> - this year should be excluded  
4       from the average, therefore making the “Before Grid Mod” calculation a 4-  
5       year average (2005-2006 and 2008-2009), not a 5-year average as the  
6       Companies have submitted in the CBA.

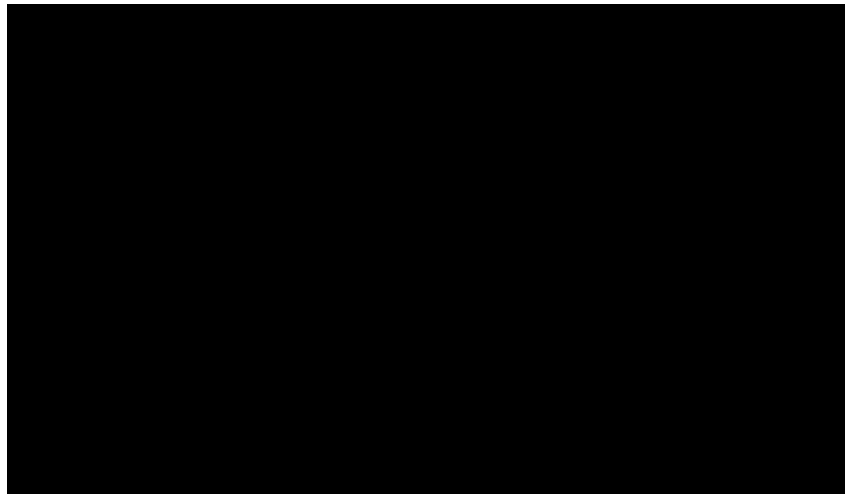
7       The box plot below shows the minimum, maximum, first/third quartiles and  
8       the median values for the 15 months with customer-minutes interrupted  
9       during major events/storms from Figure 1. The [REDACTED] customer-minutes  
10      in April 2005<sup>21</sup> are clearly an outlier and I believe the associated outage  
11      records should be removed from the calculation of the average.

---

<sup>20</sup> Confirmed by the Companies in response to ELPC Set 5–INT 6(a) Confidential (attached in Exhibit CV-3).

<sup>21</sup> Major snow/ice storms in the Cleveland area on April 2-3, 2005 and April 24-25, 2005 resulted in over [REDACTED] customer-minutes interrupted.





1

2 **Q. Are there other outliers in the outage data?**

3 A. Yes, I believe so. The diagram below shows the annual customer-minutes  
4 interrupted during major storms/events used by the Companies in the “Before  
5 Grid Mod” and “After Grid Mod” comparison of the SGMI circuits  
6 (excluding April 2005). There were only two major storms/events during the  
7 2015-2016 period<sup>22</sup> and I believe that the favorable reliability was related to  
8 mild weather, not Grid Mod improvements. To assess the expected reliability  
9 improvement from DA during widespread outages, I believe it’s important to  
10 compare “before” and “after” years with comparable levels of major  
11 storms/events. I therefore believe the 2015-2016 period is also an outlier and  
12 should be excluded from the calculation of the average.

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<sup>22</sup> 6/23/2015 ([REDACTED] customer-minutes interrupted) and 2/20/2016 ([REDACTED] customer-minutes interrupted).

1

2 **Q. Were you able to evaluate the outage data for the SGMI Circuits from**  
3 **2010-2013 to include in your analysis?**

4 A. No. We requested this data through discovery but the Companies replied that  
5 the data was not available and not relevant, and we had not received it at the  
6 time I finalized my testimony.<sup>23</sup>

7 **Q. What are the expected reliability improvements after eliminating**  
8 **duplicate data and eliminating outliers from the calculations?**

9 A. After removing the duplicate 7/31/2006 outage records from the data  
10 excluding major storms/events and eliminating April 2005, 2007, and 2015-  
11 2016 from the calculation of the averages, the revised reliability  
12 improvements from DA are shown in Table 2 below.<sup>24</sup>

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<sup>23</sup> Companies' Supplemental Response to ELPC Set 5 – RPD-005 (attached in Exhibit CV-3).

<sup>24</sup> See 'WP ELPC Set 2-RPD-003 Attachment 7 Confidential #2.xlsx' and 'WP ELPC Set 2-RPD-003 Attachment 8 Confidential #2.xlsx'

	Expected Improvement	
	SAIDI	SAIFI
Platform	15%	6%
DA - major storms/events	<del>46%</del> 8%	<del>40%</del> 12%
DA - excluding major storms/events	<del>28%</del> 16%	<del>9%</del> 8%

**Table 3**

1

2 **Q. Are the values in Table 3 consistent with the reliability improvements**  
3 **that other Ohio EDUs have realized from their DA programs?**

4 A. Yes. Ohio Power Company (“AEP Ohio”), as part of its gridSMART  
5 initiative, deployed its version of DA called Distribution Automation Circuit  
6 Reconfiguration (“DACR”). In its Business Case for Phase 2 of gridSMART,  
7 AEP Ohio reported a 9.4% improvement in SAIDI from DACR.<sup>25</sup>

8 **Q. Are you testifying that the expected reliability improvement percentages**  
9 **in Table 3 are the correct values to use as inputs to the ICE Calculator**  
10 **and the Grid Mod 1 CBA?**

11 A. No. Although these revised values are closer to what I’ve seen from other  
12 utilities in their Grid Mod proposals and closer to the Companies’ expected  
13 improvements from Platform, these reliability improvement percentages are  
14 based only on my brief review of the Companies’ calculations and underlying  
15 outage data. There may be more errors in the outage data or additional outliers  
16 to exclude. Conversely, there may be legitimate reasons why the Companies  
17 have included this data in the calculations and my analysis is incorrect.

18 Because the Companies have not responded to multiple attempts to validate  
19 our concerns, I don’t know what the correct values are to use in the ICE  
20 Calculator and CBA. As I will explain later, I recommend that the  
21 Commission require the Companies to be fully transparent in their

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<sup>25</sup> Case No. 13-1939-EL-RDR, Application of Ohio Power Company to Initiate Phase 2 of its gridSMART Project and to Establish the gridSMART Phase 2 Rider (Sept. 13, 2013), Attachment A, p. 4.

1 explanation of the Grid Mod 1 CBA to Staff and stakeholders before  
2 considering approval of the Stipulation.

3 **2) With Corrections, the Benefits of Grid Mod 1 do not Exceed the**  
4 **Costs**

5 **Q. What are the results of the CBA using the revised values forexpected**  
6 **reliability improvement from DA?**

7 A. I applied the revised reliability improvements from DA shown above to the  
8 ICE inputs, keeping all other values the same. This reduced the DA Benefits  
9 from \$1,235 million to \$389 million (20 year nominal).<sup>26</sup> The resulting total  
10 Benefits in the Companies' CBA have an NPV of \$418 million. Combined  
11 with the \$574 million of costs, the benefit-to-cost ratio is 0.7 on a NPV  
12 basis.<sup>27</sup>

13 In other words, using the revised values for reliability improvements from  
14 DA after adjusting for the questionable data, the benefits of Grid Mod 1 do  
15 not exceed the costs as required by the PowerForward Roadmap.

16 **Q. Do you have other references that support the lower Benefits of DA**  
17 **compared to those in the Companies' CBA?**

18 A. Yes. In response to an ELPC data request, the Companies provided a 2013  
19 Smart Grid Consumer Collaborative ("SGCC") report analyzing the costs and  
20 benefits of 26 smart meter and DA projects.<sup>28</sup> The report includes an analysis  
21 of the fault location/isolation benefits of DA and estimates \$40.14 per

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<sup>26</sup> See 'WP ICE Outputs.xlsx' and 'WP ELPC Set 2-RPD-002 Attachment1  
Confidential.xlsx.'

<sup>27</sup> See 'WP ELPC Set 2-RPD-002 Attachment 1 Confidential.xlsx.'

<sup>28</sup> Companies' Response to ELPC Set 2 – RPD-003, Attachment 2, *Smart Grid Economic and Environmental Benefits – A Review and Synthesis of Research on Smart Grid Benefits and Costs*, Smart Grid Consumer Collaborative, October 8, 2013 ("SGCC Report") (attached in Exhibit CV-3).

customer per year of indirect economic benefits.<sup>29</sup> Applying this to the Companies' proposed 200 circuits for DA results in [REDACTED] of Benefits.<sup>30</sup> This is significantly less than the \$1,235 million (20-year nominal) in the Companies' CBA.

**Q. Please summarize the evidence disputing the Companies' DA reliability claims in the CBA.**

A. The Companies are claiming a 40-46% improvement in reliability during major storms/events from DA in the Grid Mod 1 CBA. After correcting for flawed data and outliers, I calculate an 8-12% improvement during major storms/events. My revised calculations are consistent with the Companies' own Grid Modernization Business Plan, which states that at best, "the reliability improvement (from DA) could be as much as 24 percent", as well as AEP Ohio's report of a 9.4% improvement in SAIDI from its DA program.

The Companies are claiming \$1,235 million (20-year nominal) of Benefits due to the reliability improvement from DA. After correcting for flawed data and outliers and using the Companies' methodology, I calculate \$389 million (20-year nominal) of Benefits. Using the value from the SGCC Report cited above, I calculate [REDACTED].

**Q. What are the implications of this?**

A. The Companies' CBA and overall cost-effectiveness of Grid Mod 1 is very sensitive to the assumed reliability improvement from DA, particularly during major storms/events. I believe it is imperative that the Commission, Staff and all stakeholders clearly understand and agree with the underlying data and assumptions in the Companies' CBA, particularly for DA, before the Commission considers approval of the Stipulation. As I will explain later, I also believe it is important to establish reliability performance standards and

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<sup>29</sup> *Id.*, p. 39 of 61.

<sup>30</sup> See 'WP SGCC DA Benefits Confidential.xlsx.'

1 metrics to measure the Companies' realization of the reliability improvements  
2 from DA.

3 **3) The CBA Includes Other Questionable Assumptions**

4 **Q. Are there other assumptions in the CBA that you question?**

5 A. Yes. One of the AMI Benefit categories in the CBA is energy savings related  
6 to Customer Energy Management ("CEM"). My understanding is that CEM  
7 involves customers responding to new AMI information and/or enabling  
8 technologies to reduce their energy consumption. The Companies are  
9 attributing \$55 million (20-year nominal) of Benefits to this category.

10 In the CBA, the Companies assume a 10% customer participation rate  
11 beginning in Year 2 and 2% annual energy savings from CEM. In response  
12 to a data request seeking the sources of these assumptions<sup>31</sup>, the Companies  
13 provided the 2015 final evaluation of their Smart Grid Investment Grant  
14 ("SGIG") Consumer Behavior Study ("Behavior Study").<sup>32</sup>

15 **Q. Please explain the scope and key results from the Behavior Study.**

16 A. The report explains:

17 (The Companies undertook) a three-year consumer behavior  
18 study to evaluate residential customer response to alternative  
19 inducements to alter their electricity usage during the  
20 afternoon hours of hot summer days ... The focal point of  
21 the study was to quantify how residential customers respond  
22 to a monetary inducement, such as peak time rebate (PTR),  
23 to reduce load during pre-specified hours (events) with a  
24 day's advance notice.

25 In addition (to smart meters), the study evaluated the impacts  
26 of two enabling technologies on customer response: the in-  
27 home display (IHD) and programmable controllable  
28 thermostat (PCT). Only customers identified as having

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<sup>31</sup> Companies' Response to ELPC Set 2-RPD-003 (attached in Exhibit CV-3).

<sup>32</sup> Companies' Response to ELPC Set 2-RPD-003, Attachment 1, *FirstEnergy's Smart Grid Investment Grant Consumer Behavior Study, Phase 1 – Final Evaluation, 2015 Technical Report*, EPRI, June 2015 (attached in Exhibit CV-3).

1 central air conditioning were eligible to receive a PCT. The  
2 customers without central air were eligible to receive an IHD  
3 ...

4 During the summer of 2012, PTR resulted in substantial  
5 usage reductions during events (15 were called) for  
6 customers who allowed the company to control the PCT  
7 during events. The reduction was considerably lower, but  
8 still statistically significant for customers who managed the  
9 PCT themselves during events ... The group that received an  
10 IHD and was offered PTR payments exhibited a load  
11 reduction similar to that of the self-managed PCT group.<sup>33</sup>

12 **Q. Do the results of this Behavior Study support the Companies**  
13 **assumptions for CEM customer participation and energy savings in the**  
14 **CBA?**

15 A. No. The Behavior Study is very different from what the Companies propose  
16 in Grid Mod 1. The Companies actively recruited customers to participate in  
17 the Behavior Study using a combination of direct mail, e-mail, and phone  
18 solicitation.<sup>34</sup> Additionally, it's not clear from the report but I suspect there  
19 was also a focused effort to educate participating customers on the details of  
20 the Behavior Study and how to use the enabling technologies. Based on what  
21 I've reviewed, Grid Mod 1 includes no budget for CEM marketing,  
22 recruitment, or customer education to achieve the assumed 10% participation  
23 rate or 2% energy savings beginning in Year 2.

24 The Study also demonstrated that energy savings were greatest for customers  
25 with enabling technologies, specifically utility-controlled PCTs. Grid Mod 1  
26 includes no budget for enabling technologies (such as the successor to the  
27 PCT, the smart thermostat<sup>35</sup>).

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<sup>33</sup> *Id.*, pp. 7 and 10.

<sup>34</sup> *Id.*, p. 27.

<sup>35</sup> Smart thermostats include Wi-Fi connectivity to the Internet. Many have occupancy sensors to adjust temperatures when residents are away from home and "learning" capabilities to continually optimize comfort and energy consumption. They are also controllable remotely from smart phones, tablets and computers making them easier and more convenient to program or adjust.

1 In other words, the Companies have made assumptions in the CBA for CEM  
2 that are not supported based on the proposed scope and funding for Grid Mod  
3 1.

4 **Q. What do you recommend?**

5 A. The review and potential approval process for the Stipulation, Grid Mod 1,  
6 and its CBA has been rushed and opaque, which is the opposite of what the  
7 Commission called for in the PowerForward Roadmap. There are many  
8 unanswered questions about the data and assumptions in the CBA and I'm  
9 not convinced that the Grid Mod 1 "benefits ... exceed costs on a net present  
10 value basis" as required by PowerForward.

11 I recommend that the Commission tap the brakes on the Stipulation approval  
12 process, require the Companies to be transparent, and give Staff and  
13 stakeholders a chance to review and understand all elements of Grid Mod 1  
14 and its CBA. I also have specific recommendations for modifications to Grid  
15 Mod 1 to better ensure the realization of customer benefits.

16 **6. Grid Mod 1 Should Be Modified to Ensure That**  
17 **Customers Fully Realize the Benefits**

18 **Q. What changes to Grid Mod 1 do you recommend to better ensure the**  
19 **realization of customer benefits?**

20 A. As I previously described, the Companies' SGIG Consumer Behavior Study  
21 demonstrated that customer energy savings and peak demand reductions can  
22 be maximized when AMI and time-varying rates are accompanied by  
23 enabling technologies, such as smart thermostats.

24 The Stipulation acknowledges the important role of enabling technologies for  
25 achieving customer benefits, stating "Within six months of an Opinion &  
26 Order in the current case, and after consultation with the GridMod  
27 collaborative group, the Companies will propose a time-varying rate offering



1 for non-shopping customers, which will be designed to achieve the energy  
2 and capacity savings detailed in the cost-benefit analysis and should leverage  
3 enabling devices, e.g. smart thermostats.”<sup>36</sup>

4 However, as I stated previously, Grid Mod 1 includes no budget for smart  
5 thermostats and no budget for customer communication and education to  
6 achieve the assumed 10% participation rate in CEM beginning in Year 2.

7 Lessons learned from other utilities suggest that this is a significant gap in the  
8 Grid Mod 1 plan. The previously referenced Smart Grid Consumer  
9 Collaborative Report provided by the Companies states:

10 Customer participation level is the single largest benefit  
11 driver for many capabilities that Smart Meters facilitate,  
12 including time-varying rates, prepayment programs, and  
13 customer energy management.<sup>37</sup>

14 The SGCC Report also states:

15 The single biggest driver of the available benefits of time-  
16 varying rates is customer participation rates. There are a  
17 number of actions stakeholders can take to increase customer  
18 participation rates, though many of them – including  
19 changing misperceptions that customers may hold and  
20 addressing structural winners and losers – can be challenging  
21 ... The second biggest driver is the extent to which  
22 customers shift and/or reduce their electric usage. Higher  
23 variations between off-peak and on-peak pricing lead to  
24 higher shifting behaviors. Enabling technologies such as  
25 programmable thermostats can also drive greater shifting.<sup>38</sup>

26 I recommend that the Commission require the Companies to modify the Grid  
27 Mod I scope to include investments in the deployment of smart thermostats  
28 in conjunction with the AMI deployment. This should include sufficient  
29 budget for customer communications and education to achieve the  
30 Companies’ targeted 10% participation in CEM beginning in Year 2. Given

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<sup>36</sup> Stipulation, p. 17

<sup>37</sup> SGCC Report, p. 49 of 61

<sup>38</sup> SGCC Report, p. 25 of 61

1 the opportunity to coordinate the marketing and customer education for smart  
2 thermostats with the AMI rollout, the Commission should ensure that the  
3 Companies make smart thermostats understandable and easily available to  
4 customers.

5 **Q. What other changes do you recommend to Grid Mod 1 or the**  
6 **Stipulation?**

7 A. The Stipulation states that midway through the Grid Mod 1 implementation  
8 period, Staff or an outside consultant will perform an operational savings<sup>39</sup>  
9 assessment/audit to evaluate whether the actual functionality and  
10 performance of the project is consistent with the planned outcomes. The  
11 review may also include an independent cost-benefit analysis for Grid Mod  
12 1.<sup>40</sup>

13 This assessment/audit should not be limited to just operational savings, which  
14 are a small percentage of the overall CBA. I recommend that the Commission  
15 require Staff or the consultant to include in the assessment/audit a review of  
16 all Benefits from Grid Mod 1, including customer energy savings, peak  
17 demand reductions, and reliability improvements.

18 **Q. Do you recommend other changes?**

19 A. Yes. The Stipulation includes a commitment by the Companies to revise their  
20 reliability performance standards under OAC 4901:1-10-10(B)(7) (which  
21 exclude major storms/events) before and after Grid Mod 1 deployment.<sup>41</sup> I  
22 believe there should be an explicit linkage between the Companies' revised  
23 reliability performance standards and the assumed Benefits or reliability  
24 improvement expectations in the CBA.

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<sup>39</sup> Operational savings in the CBA include reduced meter readers and back-office functions, fewer inspections, fewer truck rolls, etc.

<sup>40</sup> Stipulation, p. 22

<sup>41</sup> *Id.*, p. 21

1 In other words, if the Companies believe a 28% reliability improvement in  
2 SAIDI excluding major storms/events is achievable with DA as they claim in  
3 the CBA, this should be the basis for the new reliability performance standard.

4 **Q. The performance standards under OAC 4901:1-10-10(B)(7) only include**  
5 **SAIFI and CAIDI. How would the improvement in SAIDI apply?**

6 A. As I explained earlier in my testimony, there is a mathematical relationship  
7 between SAIDI, SAIFI, and CAIDI. To repeat,  $CAIDI = SAIDI / SAIFI$ . An  
8 expected improvement in SAIDI results in corresponding improvements in  
9 SAIFI and/or CAIDI and can be translated by the Companies to new  
10 performance standards under OAC 4901:1-10-10(B)(7).

11 **Q. Do you recommend other changes?**

12 A. Yes. The Stipulation includes performance metrics such as direct customer  
13 benefits from DA “self-healing events”.<sup>42</sup> Since the majority of the Benefits  
14 in the Companies’ CBA are from DA reliability improvements during major  
15 storms/events, I recommend that the Commission require the Companies to  
16 establish a performance metric specifically for DA reliability improvements  
17 during major storms/events. The Commission should also set a performance  
18 target that aligns with the expected improvement in the CBA and establish  
19 rewards and penalties for achieving the target.

20 In other words, if the Companies believe a 40-46% improvement in reliability  
21 during major storms/events is achievable from DA as they claim in the CBA,  
22 the Commission should measure and reward/penalize the Companies based  
23 on their ability to achieve this improvement.

## 24 **7. Summary of Recommendations**

25 **Q. Please summarize your recommendations.**

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<sup>42</sup> *Id.*, Attachment C

1     A.     I recommend that the PUCO:

- 2             • Delay approval of the Stipulation until questions are answered and  
3                 Staff and stakeholders fully understand the Grid Mod 1 CBA. The  
4                 Commission should require the Companies to be fully transparent in  
5                 explaining answers to questions such as:
  - 6                     – Is the underlying outage data used to quantify the expected  
7                         reliability improvements from DA reasonable and error free?
  - 8                     – Are the assumptions used throughout the CBA reasonable and  
9                         achievable with the proposed Grid Mod 1 scope and funding?
  - 10                    – What level of spending on DA and other Grid Mod 1 programs  
11                       results in a CBA where “benefits ... exceed costs on a net present  
12                       value basis” as required by PowerForward?
- 13            • Require the Companies to modify the Grid Mod I scope to include  
14               investments in the deployment of smart thermostats in conjunction  
15               with the AMI deployment. This should include sufficient budget for  
16               customer communications and education to achieve the Companies’  
17               targeted 10% CEM participation rate beginning in Year 2.
- 18            • Require Staff or the consultant to include in the mid-period Grid Mod  
19               1 assessment/audit a review of all CBA Benefits from Grid Mod 1 (not  
20               just operational savings), including customer energy savings, peak  
21               demand reductions, and reliability improvements.
- 22            • Require the Companies to revise their reliability performance  
23               standards under OAC 4901:1-10-10(B)(7) consistent with the expected  
24               reliability improvements in the CBA.
- 25            • Require the Companies to establish a performance metric specifically  
26               for DA reliability improvements during major storms/events. The  
27               Commission should also set a performance target that aligns with the  
28               expected reliability improvement during major storms/events in the

1 CBA and establish rewards and penalties based on the Companies'  
2 ability to achieve the target.

3 **Q. Does this conclude your testimony?**

4 A. Yes.

**This foregoing document was electronically filed with the Public Utilities**

**Commission of Ohio Docketing Information System on**

**2/6/2019 8:04:59 AM**

**in**

**Case No(s). 16-0481-EL-UNC, 17-2436-EL-UNC, 18-1604-EL-UNC, 18-1656-EL-ATA**

Summary: Testimony - Public with Revised Redactions - of Curt Volkmann electronically filed by Mr. James F Lang on behalf of Environmental Law & Policy Center and Natural Resources Defense Council and Ohio Environmental Council