

**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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### **EXHIBITS**

Exhibit CV-1	Statement of Qualifications for Curt Volkmann
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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  
4        Avenue #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 &  
7        Policy 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  
7       with specific recommendations for the Commission to consider. Many of  
8       these 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-  
23       Benefit Analysis (“CBA”) for the Companies’ phase one grid modernization  
24       plan (“Grid Mod 1”). I also make recommendations for changes to Grid  
25       Mod 1 to 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  
7             PowerForward 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  
21            (not just operational savings), including customer energy savings,  
22            peak 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  
25            expected 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  
13 the 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  
18 and the necessary supporting communications infrastructure, a Meter Data  
19 Management System ("MDMS"), Distribution Automation ("DA") on at  
20 least 200 circuits, Integrated Volt-VAR Control ("IVVC") on at least 202  
21 circuits, an Advanced Distribution Management System ("ADMS"), and  
22 Platform.

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

24 A. According to the Companies' 2016 Grid Modernization Business Plan:

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

1 DA focuses on improved reliability and is comprised of  
2 substation equipment, circuit reclosers, and wireless  
3 communications infrastructure. Fault Isolation Service  
4 Restoration (“FISR”) is a distribution automation  
5 application that runs a series of algorithms to determine the  
6 optimal operation of reclosers on a feeder so as to minimize  
7 both the duration as well as the number of customers  
8 affected by a power outage. This technology can be used to  
9 open and close reclosers to connect and disconnect certain  
10 portions of the grid as the real time operating conditions  
11 warrant. Particularly applicable to service outage situations,  
12 this technology provides the capability to automatically  
13 maximize the restoration of power from momentary  
14 abnormal conditions, minimize sustained customer outages  
15 as well as support FISR.<sup>4</sup>

16 **Q. What is Platform?**

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

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

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

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

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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 A. The Companies have combined the Grid Mod 1 capital costs, incremental  
2 O&M, operational savings, and customer/societal benefits (“Benefits”) in  
3 the CBA. The Companies attribute the Benefits to four elements of Grid  
4 Mod 1, specifically AMI, DA, IVVC, and Platform.

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

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

10 **Q. What are the results of the Companies’ CBA?**

11 A. The Companies are claiming \$808 million of benefits and \$574 million of  
12 costs for a Benefit-to-Cost ratio of 1.4 on a net present value (“NPV”) basis.  
13 The Companies’ CBA is summarized in Attachment B of the Stipulation  
14 and 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

15  
16 **Q. What do you consider to be potential flaws in the Grid Mod 1 CBA?**

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

1 A. When I first reviewed the Stipulation and Attachment B, I immediately  
2 focused on the \$1,782 million nominal and \$808 million NPV of Benefits.  
3 For the relatively modest scope of Grid Mod 1, the magnitude of these  
4 Benefits is not credible. After reviewing the Companies' responses to data  
5 requests with further detail on the CBA, I found flawed data and  
6 assumptions in the underlying analysis.

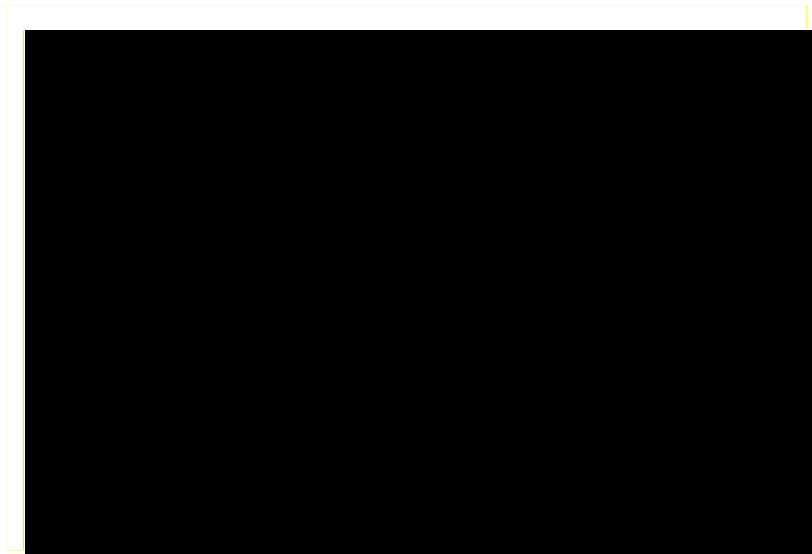
7 **Q. Have you communicated with the Companies about your concerns?**

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

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

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

15 A. The Companies attribute \$ [REDACTED] or [REDACTED] % of the  
16 total nominal Benefits to Distribution Automation or DA. The diagram  
17 below shows the sources of Benefits in the Companies' Grid Mod 1 CBA.



18

1 Of the \$ [REDACTED] million of DA Benefits, the Companies attribute \$ [REDACTED] million  
2 [REDACTED] % of the total Benefits) to improved reliability from DA during major  
3 storms/events, and \$ [REDACTED] million ([REDACTED] % of the total Benefits) to improved  
4 reliability from DA excluding major storms/events.<sup>8</sup>

5 **Q. Is it credible that reliability benefits from DA during major**  
6 **storms/events would be [REDACTED] the benefits during non-major**  
7 **storm/events?**

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

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

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

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

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

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<sup>8</sup> Source: 'ELPC Set 2-RPD-002 Attachment 1 Confidential.xlsx' (attached in Confidential Exhibit CV-4).

<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>.

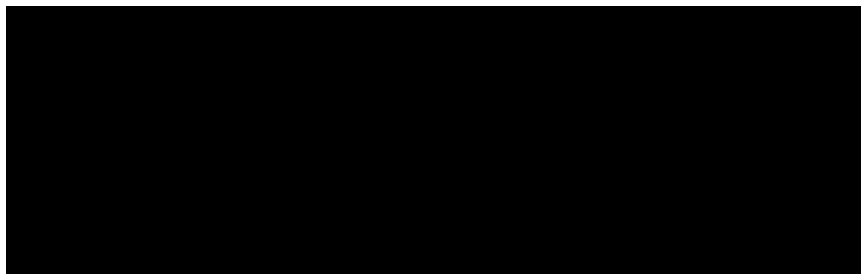
1 A. I have seen other utilities use the ICE Calculator as a basis for justifying the  
2 cost effectiveness of proposed grid modernization programs. Some of these  
3 justifications have been credible and others have not. The validity of the  
4 ICE Calculator output is only as good as the validity of the input data. If the  
5 input data is not credible, the ICE output is not credible – it can be the  
6 classic case of garbage in, garbage out.

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

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

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

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



17

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

---

<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 Confidential Exhibit CV-4).

1 A. I've not reviewed the supporting analysis for Platform but improvements of  
2 ■% for SAIDI and ■% for SAIFI seem reasonable. The expected reliability  
3 improvements from DA are not credible, particularly during major  
4 storms/events. As I previously described, the automatic reconfiguration of  
5 circuits to restore customers with DA is significantly less effective when  
6 there is widespread damage during a major storm/event with multiple  
7 circuits impacted.

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

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

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

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

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

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

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

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

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

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

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

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

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

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<sup>15</sup> Companies’ Confidential Responses to ELPC Set 5-INT-005(a) and ELPC Set 5-INT-006(b) (attached in Confidential Exhibit CV-4).

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

1 supplemental response that [REDACTED]  
2 [REDACTED]  
3 [REDACTED]<sup>17</sup>

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

6 A. After removing the duplicate [REDACTED] outage records from the major  
7 storms/events data and the duplicate [REDACTED] outage records from the data  
8 excluding major storms/events, the revised reliability improvements from  
9 DA are shown in Table 2 below.<sup>18</sup>

10 [REDACTED]

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

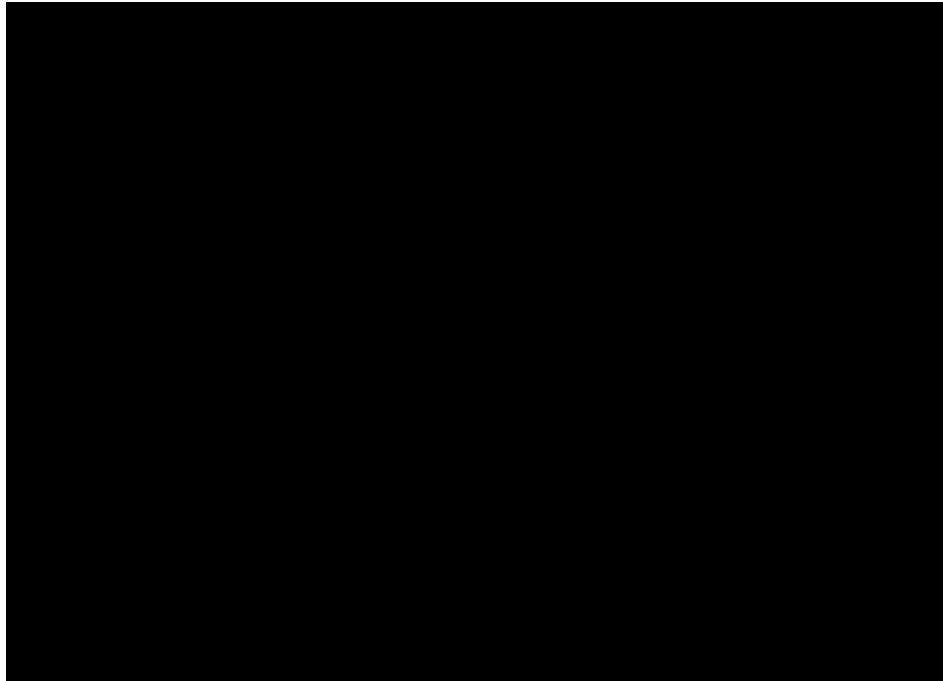
13 A. Yes, I believe the Companies have included outlier data in the analysis that  
14 is skewing the calculation of averages and inflating the expected reliability  
15 improvements from DA during major storms/events. Figure 1 below shows  
16 the 2005-2009 customer-minutes interrupted during major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

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<sup>17</sup> Companies’ Response to ELPC Set 7-INT-3 Confidential (attached in Confidential Exhibit CV-4).

<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 Confidential Exhibit CV-4).



1

2

3

4

5

6

There were [REDACTED] months with major events/storms over this period. Note that there were no major storms/events in [REDACTED]<sup>20</sup> - this year should be excluded from the average, therefore making the “Before Grid Mod” calculation a 4-year average ([REDACTED]) not a 5-year average as the Companies have submitted in the CBA.

7

8

9

10

11

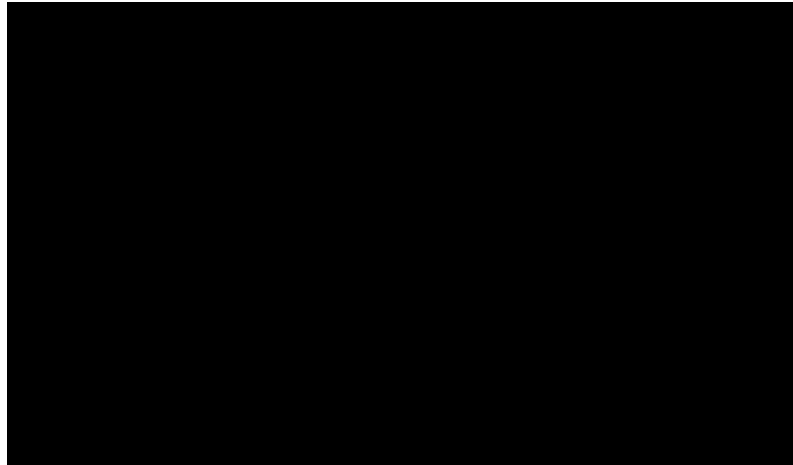
The box plot below shows the minimum, maximum, first/third quartiles and the median values for the [REDACTED] months with customer-minutes interrupted during major events/storms from Figure 1. The [REDACTED] customer-minutes in [REDACTED] are clearly an outlier and I believe the associated outage records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

---

<sup>20</sup> [REDACTED] (attached in Confidential Exhibit CV-4).

<sup>21</sup> Major snow/ice storms in the Cleveland area on [REDACTED] 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  
5           “Before Grid Mod” and “After Grid Mod” comparison of the SGMI circuits  
6           (excluding [REDACTED]). There were only two major storms/events during the  
7           [REDACTED] 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  
9           reliability improvement from DA during widespread outages, I believe it’s  
10          important to compare “before” and “after” years with comparable levels of  
11          major storms/events. I therefore believe the [REDACTED] period is also an  
12          outlier and should be excluded from the calculation of the average.

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<sup>22</sup> [REDACTED]

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  
5 that the data was not available and not relevant, and we had not received it  
6 at the 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 [REDACTED] outage records from the data  
10 excluding major storms/events and eliminating [REDACTED]  
11 [REDACTED] 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'

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  
7 gridSMART, AEP Ohio reported a 9.4% improvement in SAIDI from  
8 DACR.<sup>25</sup>

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

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

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

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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 Commission require the Companies to be fully transparent in their  
2 explanation of the Grid Mod 1 CBA to Staff and stakeholders before  
3 considering approval of the Stipulation.

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

6 **Q. What are the results of the CBA using the revised values for expected**  
7 **reliability improvement from DA?**

8 A. I applied the revised reliability improvements from DA shown above to the  
9 ICE inputs, keeping all other values the same. This reduced the DA Benefits  
10 from \$ [REDACTED] to \$ [REDACTED].<sup>26</sup> The resulting total  
11 Benefits in the Companies' CBA have an NPV of \$ [REDACTED]. Combined  
12 with the \$ [REDACTED] million of costs, the benefit-to-cost ratio is [REDACTED] on a NPV  
13 basis.<sup>27</sup>

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

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

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

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<sup>26</sup> See 'WP ICE Outputs.xlsx' and 'WP ELPC Set 2-RPD-002 Attachment 1 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).

1 analysis of the fault location/isolation benefits of DA and estimates \$40.14  
2 per customer per year of indirect economic benefits.<sup>29</sup> Applying this to the  
3 Companies' proposed 200 circuits for DA results in \$ [REDACTED]  
4 [REDACTED] of Benefits.<sup>30</sup> This is significantly less than the \$ [REDACTED]  
5 [REDACTED] in the Companies' CBA.

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

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

16 The Companies are claiming \$ [REDACTED] of Benefits  
17 due to the reliability improvement from DA. After correcting for flawed  
18 data and outliers and using the Companies' methodology, I calculate \$ [REDACTED]  
19 [REDACTED] of Benefits. Using the value from the SGCC  
20 Report cited above, I calculate \$ [REDACTED]

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

22 A. The Companies' CBA and overall cost-effectiveness of Grid Mod 1 is very  
23 sensitive to the assumed reliability improvement from DA, particularly  
24 during major storms/events. I believe it is imperative that the Commission,  
25 Staff and all stakeholders clearly understand and agree with the underlying  
26 data and assumptions in the Companies' CBA, particularly for DA, before

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

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

1 the Commission considers approval of the Stipulation. As I will explain  
2 later, I also believe it is important to establish reliability performance  
3 standards and metrics to measure the Companies' realization of the  
4 reliability improvements from DA.

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

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

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

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

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

18 A. The report explains:

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

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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 In addition (to smart meters), the study evaluated the  
2 impacts of two enabling technologies on customer  
3 response: the in-home display (IHD) and programmable  
4 controllable thermostat (PCT). Only customers identified as  
5 having central air conditioning were eligible to receive a  
6 PCT. The customers without central air were eligible to  
7 receive an IHD ...

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

16 **Q. Do the results of this Behavior Study support the Companies**  
17 **assumptions for CEM customer participation and energy savings in the**  
18 **CBA?**

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

28 The Study also demonstrated that energy savings were greatest for  
29 customers with enabling technologies, specifically utility-controlled PCTs.

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

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

1 Grid Mod 1 includes no budget for enabling technologies (such as the  
2 successor to the PCT, the smart thermostat<sup>35</sup>).

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

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

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

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

## 18 **6. Grid Mod 1 Should Be Modified to Ensure That** 19 **Customers Fully Realize the Benefits**

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

22 A. As I previously described, the Companies' SGIG Consumer Behavior Study  
23 demonstrated that customer energy savings and peak demand reductions can

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<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 be maximized when AMI and time-varying rates are accompanied by  
2 enabling technologies, such as smart thermostats.

3 The Stipulation acknowledges the important role of enabling technologies  
4 for achieving customer benefits, stating “Within six months of an Opinion &  
5 Order in the current case, and after consultation with the Grid Mod  
6 collaborative group, the Companies will propose a time-varying rate  
7 offering for non-shopping customers, which will be designed to achieve the  
8 energy and capacity savings detailed in the cost-benefit analysis and should  
9 leverage enabling devices, e.g. smart thermostats.”<sup>36</sup>

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

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

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

20 The SGCC Report also states:

21 The single biggest driver of the available benefits of time-  
22 varying rates is customer participation rates. There are a  
23 number of actions stakeholders can take to increase  
24 customer participation rates, though many of them –  
25 including changing misperceptions that customers may  
26 hold and addressing structural winners and losers – can be  
27 challenging ... The second biggest driver is the extent to  
28 which customers shift and/or reduce their electric usage.  
29 Higher variations between off-peak and on-peak pricing  
30 lead to higher shifting behaviors. Enabling technologies

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

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

1                   such as programmable thermostats can also drive greater  
2                   shifting.<sup>38</sup>

3           I recommend that the Commission require the Companies to modify the  
4           Grid Mod I scope to include investments in the deployment of smart  
5           thermostats in conjunction with the AMI deployment. This should include  
6           sufficient budget for customer communications and education to achieve the  
7           Companies' targeted 10% participation in CEM beginning in Year 2. Given  
8           the opportunity to coordinate the marketing and customer education for  
9           smart thermostats with the AMI rollout, the Commission should ensure that  
10          the Companies make smart thermostats understandable and easily available  
11          to customers.

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

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

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

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

<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

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

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

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

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

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

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

21    A.     Yes. The Stipulation includes performance metrics such as direct customer  
22           benefits from DA "self-healing events".<sup>42</sup> Since █ of the Benefits  
23           in the Companies' CBA are from DA reliability improvements during major  
24           storms/events, I recommend that the Commission require the Companies to  
25           establish a performance metric specifically for DA reliability improvements  
26           during major storms/events. The Commission should also set a performance

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

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

1 target that aligns with the expected improvement in the CBA and establish  
2 rewards and penalties for achieving the target.

3 In other words, if the Companies believe a [REDACTED] % improvement in  
4 reliability during major storms/events is achievable from DA as they claim  
5 in the CBA, the Commission should measure and reward/penalize the  
6 Companies based on their ability to achieve this improvement.

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

8 **Q. Please summarize your recommendations.**

9 A. I recommend that the PUCO:

- 10 • Delay approval of the Stipulation until questions are answered and  
11 Staff and stakeholders fully understand the Grid Mod 1 CBA. The  
12 Commission should require the Companies to be fully transparent in  
13 explaining answers to questions such as:
  - 14 – Is the underlying outage data used to quantify the expected  
15 reliability improvements from DA reasonable and error free?
  - 16 – Are the assumptions used throughout the CBA reasonable and  
17 achievable with the proposed Grid Mod 1 scope and funding?
  - 18 – What level of spending on DA and other Grid Mod 1 programs  
19 results in a CBA where “benefits ... exceed costs on a net  
20 present value basis” as required by PowerForward?
- 21 • Require the Companies to modify the Grid Mod I scope to include  
22 investments in the deployment of smart thermostats in conjunction  
23 with the AMI deployment. This should include sufficient budget for  
24 customer communications and education to achieve the Companies’  
25 targeted 10% CEM participation rate beginning in Year 2.

- 1           • Require Staff or the consultant to include in the mid-period Grid Mod  
2           1 assessment/audit a review of all CBA Benefits from Grid Mod 1  
3           (not just operational savings), including customer energy savings,  
4           peak demand reductions, and reliability improvements.
- 5           • Require the Companies to revise their reliability performance  
6           standards under OAC 4901:1-10-10(B)(7) consistent with the  
7           expected reliability improvements in the CBA.
- 8           • Require the Companies to establish a performance metric specifically  
9           for DA reliability improvements during major storms/events. The  
10          Commission should also set a performance target that aligns with the  
11          expected reliability improvement during major storms/events in the  
12          CBA and establish rewards and penalties based on the Companies'  
13          ability to achieve the target.

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

15   A.     Yes.

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