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# **OPERATIONAL BENEFITS ASSESSMENT OF FIRSTENERGY OHIO'S GRID MOD I**

**NOVEMBER 14, 2022**

**PREPARED FOR**

Public Utilities Commission of Ohio

**PREPARED BY**

Daymark Energy Advisors, Inc.



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## LIST OF ACRONYMS

<b>ADMS</b>	Advanced Distribution Management System
<b>AEP</b>	American Electric Power (Ohio Power Company)
<b>AMI</b>	Advanced Metering Infrastructure
<b>API</b>	Application Program Interface
<b>CBA</b>	Cost-Benefit Analysis
<b>CEI</b>	Cleveland Electric Illuminating (Illuminating Company)
<b>CEM</b>	Customer Energy Management
<b>CEUD</b>	Customer Energy/Electricity Usage Data
<b>CMI/CI</b>	Customer Minutes Interrupted/ Customers Interrupted
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>CRES</b>	Competitive Retail Electric Service
<b>CVR</b>	Conservation Voltage Reduction
<b>DA</b>	Distribution Automation
<b>DER</b>	Distributed Energy Resource
<b>DERMS</b>	Distributed Energy Resource Management System
<b>DMR</b>	Distribution Modernization Rider
<b>ED</b>	Electric Distribution
<b>EDI</b>	Electronic Data Interchange
<b>ESP</b>	Electric Security Plan
<b>FE</b>	FirstEnergy
<b>FLISR</b>	Fault Location Isolation and Service Restoration
<b>FTE</b>	Full-Time Equivalent
<b>HAN</b>	Home Area Network
<b>IEE</b>	Itron Enterprise Edition
<b>IVVC</b>	Integrated Volt/Var Control
<b>kW</b>	Kilowatt
<b>kWh</b>	Kilowatt-hour
<b>MDMS</b>	Meter Data Management System
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt-hour
<b>NPV</b>	Net Present Value
<b>OE</b>	Ohio Edison
<b>OMA</b>	Operations Mobile Application
<b>PMO</b>	Project Management Organization
<b>PON</b>	Power Outage Notification
<b>RFP</b>	Request For Proposal
<b>SAIDI</b>	System Average Interruption Duration Index
<b>SAIFI</b>	System Average Interruption Frequency Index

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<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SGCC</b>	Smart Grid Consumer Collaborative
<b>SGMI</b>	Smart Grid Modernization Initiative
<b>SSO</b>	Standard Service Offer
<b>TCJA</b>	Tax Cuts and Jobs Act
<b>TE</b>	Toledo Edison
<b>TVR</b>	Time Varying Rate
<b>VEE</b>	Validating, Editing, And Estimating
<b>VVO</b>	Volt/Var Optimization
<b>WACC</b>	Weighted Average Cost of Capital



## SELECTED TERMINOLOGY

**Benefit category or benefit stream** – Used to refer generically to any of the combined set of twenty-two operational savings and non-operational benefits.

**Grid Mod I cost-benefit analysis** – Refers to PAC Set 1 DR 3 Attachments 1-2 Confidential. Daymark generally relied upon Attachment 2 in performing its review; however, we note that any adjustments between the two versions do not have a material impact on our audit approach and conclusions.

**Distribution automation (DA)** – Used to refer to the entire subprogram of Grid Mod I comprising SCADA-capable recloser deployment and related investments. Our use of the terms “distribution automation” or “DA” are not to be construed as a characterization of the extent to which automated restoration outcomes are being achieved. Where we seek to discuss automated switching, we refer to the status and utilization of the Fault Location, Isolation, and Service Restoration (FLISR) advanced application within the ADMS.

**Integrated volt/var control (IVVC) or volt/var optimization (VVO)** – Used to refer to the entire subprogram of Grid Mod I comprising deployment of capacitor banks, voltage regulators, associated controls, etc. No distinction is intended between the terms IVVC and VVO. Our use of the terms should not be construed as indicating that specific software capabilities have been active.

**Metrics or Grid Mod I Reporting Metrics** – Used to refer to the set of forty-seven data categories that the Companies submit to Staff in support of quarterly Rider AMI updates or the improvements to them that Daymark recommends throughout. The metrics were originally established in the Stipulation and were placed into effect by Grid Mod I approval in the Opinion & Order. The most up-to-date metrics Daymark reviewed were presented in Set 4 DR 25 Attachment 1 and include data through the end of June 2022.

**Non-operational benefits** – Refers to the set of benefit categories constituting the \$1,782 million nominal “estimated benefits” represented in Attachment B to the November 2018 Stipulation.

**Operational savings or operational benefits** – Refers to the set of benefit categories constituting the \$175 million nominal estimated “operational savings” represented in Attachment B to the November 2018 Stipulation.

**Opinion & Order** – Refers to the Commission’s decision in Case Nos. 16-481-EL-UNC, 17-2436-EL-UNC, 18-1694-EL-UNC, and 18-1656-EL-ATA on July 17, 2019, which, among other things, approved Grid Mod I.

**Supporting analyses** – Broadly, any of the sources from which inputs to the Grid Mod I cost-benefit analysis were derived. Daymark identified eight of these sources that were key and warranted in-depth analysis; this analysis is contained in Appendix 1 – CBA Assumption Sources.

## DISCLAIMER

In the context of this report, Daymark Energy Advisors (Daymark) intends the word “audit” to mean the review of regulatory requirements and evidentiary document review and investigations. This audit report should not be perceived as a financial or systems audit of the company’s processes, transactions, or systems, as may be required for financial reporting purposes. Daymark in this report may use the terms “review” and “assessment” to be synonymous with “audit”; these terms are not intended to specify distinct scope elements or activities.

Daymark provides this document and the opinions, analyses, evaluations, and recommendations for the sole use and benefit of the contracting parties. Daymark intends no third-party beneficiaries and, therefore, assumes no liability whatsoever to third parties for any defect, deficiency, error, or omission in any statement contained in or in any way related to this document or the services provided.

Daymark prepared this report based in part on information not within its control. While it is believed that the information that has been provided is reliable, Daymark does not guarantee the accuracy of the information relied upon.



## I. EXECUTIVE SUMMARY

On July 17, 2019, the Public Utilities Commission of Ohio (PUCO or Commission) approved and adopted a Stipulation filed in Case Nos. 16-481-EL-UNC, 17-2436-EL-UNC, et al (the “Stipulation”).<sup>1</sup> The Stipulation, in part, outlined a plan, Grid Mod I, for the FirstEnergy Ohio Utilities: Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, hereafter referred to as “The Companies” or “Companies”, to invest in a set of grid modernization technologies.<sup>2</sup> Grid Mod I is the first phase of a broader grid modernization plan<sup>3</sup> and incorporates technologies including advanced metering infrastructure (AMI), a Meter Data Management System (MDMS), Distribution Automation (DA), Integrated Volt/Var Control (IVVC), and an Advanced Distribution Management System (ADMS).<sup>4</sup>

The Stipulation as approved ordered an operational benefits assessment and review to be performed before the commencement of the next projected phase of grid modernization.<sup>5</sup> The scope of the review as commissioned includes an evaluation of whether the actual functionality and performance of the project is consistent with planned specifications as well as an independent cost-benefit analysis.<sup>6</sup>

The Commission selected Daymark Energy Advisors, Inc. (Daymark) to provide audit services to assist Staff with the review of the operational benefits in an entry dated April 20, 2022.<sup>7</sup> This report presents the results of Daymark’s review.

### A. Summary of findings and recommendations

This section presents Daymark’s top-level findings and recommendations. Additional findings and recommendations pertaining mainly to the individual technology categories can be found in Section VII.B. Further context and support for each conclusion can be found in the body of the report.

1. The lack of clear documentation of the complete assumptions behind operational savings estimates, combined with the lack of direct reporting as to

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<sup>1</sup> See Case Nos. 16-481-EL-UNC, et al., Opinion & Order, 7/17/2019 at ¶1.

<sup>2</sup> See Case Nos. 16-481-EL-UNC, et al., Stipulation and Recommendation, 11/19/2018 at 10-11.

<sup>3</sup> *Id.*, at 3.

<sup>4</sup> *Id.*, at 10

<sup>5</sup> See Case Nos. 16-481-EL-UNC, et al., Opinion & Order, 7/17/2019 at ¶44.

<sup>6</sup> *Id.*

<sup>7</sup> See Case Nos. 16-481-EL-UNC, et al., Entry, 4/20/2022 at ¶1.

operational savings being achieved, precluded a direct audit determination of a current and future level of operational savings to be credited to Rider AML.

**Recommendation: Daymark recommends that the fixed savings as indicated in the Stipulation's Attachment D for Years 4-6 be applied going forward and that the recommendations listed within this report be adopted to better measure and verify future operational savings.**

2. Daymark identified three deficiencies that pertained to the achievement and measurement of the twenty-two overall benefit categories. These were: (1) mismatch between projections and evidence<sup>8</sup>, (2) lack of data available, and (3) lack of resources dedicated. Daymark also identified a deficiency pertaining to the derivation of benefit levels from the analyses which supported the Companies' cost-benefit analysis. These deficiencies help to explain commonalities in what we observed across the numerous benefit categories and are important context to our program design suggestions.
3. Standard practice in a review of this nature relies on the audited entity providing both detail about the assumptions underlying benefits projections and data collection related to the realization of assumed benefits, such that the auditor can make an objective assessment of the entity's achievement of the assumed benefits and adherence to cost projections. For most benefit categories, FirstEnergy did not make available the assumptions on the basis of which the expectations of benefits to be achieved were developed or present evidence of performance and/or savings which related back to the original assumptions.
4. FirstEnergy does not directly track operational savings and other benefits related to its investment in Grid Mod I. The Companies have been providing the Grid Mod I Reporting Metrics that were outlined in Attachment C of the November 2018 Stipulation. Daymark found the Grid Mod I Reporting Metrics to contain a limited number of metrics that are directly informative of benefits being achieved. Many metrics relate to implementation status only (such as number of devices installed) or are indirectly informative of the Companies' progress in realizing a benefit.

**Recommendation: Daymark suggests refinements to metric definitions and additional metrics on a benefit-by-benefit and technology-by-technology basis to better form a basis for demonstrating savings in operating costs and overall benefits associated with investment.**

5. The Grid Mod I Reporting Metrics lack established target levels that can be used to baseline the monthly reported values, except in cases where targets have

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<sup>8</sup> Daymark here uses the term "evidence" to refer broadly to any information FirstEnergy offered to ascertain any fact about the Grid Mod I deployment, e.g. the Grid Mod I reporting metrics or any of FirstEnergy's responses to data requests.

been explicitly outlined in the case material.<sup>9</sup> Personnel responsible for preparing metrics are largely unaware of what metric levels might indicate in terms of the Companies' status in achieving the benefit levels and timing proposed in the Stipulation and Cost Benefit Analysis.<sup>10</sup>

**Recommendation: *For many of the metrics, setting and tracking target levels along with the actual levels achieved would be appropriate to better identify benefit categories that are lagging behind the Companies' original plan.***

6. There is no established procedure by which those responsible for collecting the metric inputs from the responsible groups use the process as an opportunity to identify and address (if necessary) the level of benefit achievement being observed.

**Recommendation: *In categories where the Companies are lagging target levels, the Companies should provide in the report both an explanation of the situation and an outline of organizational steps being taken to improve attainment of the benefit going forward.***

7. Certain benefit streams require continued engagement and organizational focus to achieve, while others accrue passively as a result of the technology being operational. The benefits best being captured at this time tend to fall into the latter category, with room for improvement in the former.

**Recommendation: *Closer tracking of the Companies' progress in achieving all benefits, through a more robust Metrics process, will aid in identifying areas where the Companies require additional focus.***

8. Certain benefit streams were represented within the Grid Mod I cost-benefit analysis (CBA) as beginning to accrue throughout the implementation phase (Years 1-3). Some of these benefits have yet to begin accruing in any meaningful quantity.<sup>11</sup>
9. There has been a focus within the Companies' Grid Mod I project management organization (PMO) on implementation of the technologies. Daymark found that the Companies were largely successful in implementing the required number of technologies in the allowed timeframe. Daymark, however, observed a lack of focus within the PMO's meetings on tracking progress related to achieving operational or monetary benefits.

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<sup>9</sup> In PAC Set 3 DR 31, FirstEnergy provided two examples of target levels: investing in at least 200 DA circuits and achieving 4% energy savings from IVVC when Grid Mod I technologies are fully deployed.

<sup>10</sup> The metric reporting process, as Daymark learned, involves data owners from different business units reporting data to the regulatory team. Daymark found knowledge of details of the cost-benefit analysis and associated expected benefits to be sorely lacking within the teams of these data owners.

<sup>11</sup> The causes for the observed delays in achieving benefits vary, but include actual implementation & commissioning timelines, lack of resources deployed to leverage technology capabilities, and, as is the case with the IVVC benefits, failure to represent the dependency on the ADMS launch timeline.

**Recommendation: We recommend further improvements to the tracking of and incentives around the Companies' achievement of benefits, such that these items become a greater focus within the project management organization.<sup>12</sup>**

10. Portions of the Grid Mod I technologies are undergoing or awaiting full activation at the time of the preparation of this report.<sup>13</sup> As such, there are several technologies and benefit streams which lack collected data to rely on for determining functionality and performance in comparison to planned specifications.

**Recommendation: Daymark recommends that both the Grid Mod I Reporting Metrics and additional recommended data be collected and analyzed for the performance of these technologies ahead of or as part of the process of reviewing the Companies' Grid Mod II.**

11. The Grid Mod I cost-benefit analysis does not meet the level of transparency which would be expected per the Commission's grid modernization proceeding conclusions, or, more broadly, a level which would allow for audit conclusions to be reached. The Companies' cost-benefit analysis as referenced in the Stipulation was the aggregation of several external analyses, several of which were nontransparent. Daymark found a lack of documentation as to the reasonableness of using certain supporting analyses or specific data from such analyses as inputs within the Companies' cost-benefit analysis.

**Recommendation: For many benefit categories, Daymark recommends that the Companies be required to revisit benefit projection methods with the charge to improve transparency and, therefore, future auditability. Further, where we identify gaps in documentation pertaining to the usage of supporting analyses within the Grid Mod I CBA, we urge that such revisitation involve stakeholder scrutiny.**

12. Collectively, the demonstrated operational savings have fallen short of the level included in the Stipulation. We note several implications of this observation: 1) the benefits of the Companies' grid modernization investments have been

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<sup>12</sup> Daymark notes that the Companies' project management organization sits at a unique place within the organization. The technologies and their associated benefit streams touch several diverse utility functions including, but not limited to, operations, rate design, customer service, etc. Daymark offers that revising the tracking requirements and incentives around the program may result in the Grid Mod I project management organization taking a more active role in identifying need for resources to achieve projected benefits, for example.

<sup>13</sup> The ADMS system was launched in early August 2022 as drafting of this report was underway. Shortly after the ADMS launch, the advanced applications, FLISR and IVVC, were launched. We note that the Companies anticipate an advisory period to be required before the FLISR is utilized for truly automated switching. No Grid Mod I reporting metrics were available reflecting performance of any technologies post-ADMS launch. Further, we note that additional benefit categories lack operational data; for example, per Set 3 DR 7 a portion of the service outage management capability of AMI is awaiting integration into the ADMS.



slower in accruing than anticipated in the cost-benefit analysis, 2) projected benefits require an increased level of organizational effort to achieve, and 3) certain types of benefits resulting from the investment may not be conducive to representation in dollar values.

**Recommendation:** *Daymark recommends revised metric categories that will support Grid Mod I stakeholders in understanding the status of operational savings achievement and allow for actions to be taken in response to either shortfalls or surpluses regarding operational savings levels.*

## II. INTRODUCTION

This section of the report addresses each of the following areas and provides information that grounds the analysis undertaken by Daymark by ensuring that the parameters of the audit are explicitly understood. The areas include:

- History of the Grid Mod I case
- Brief overview of the FirstEnergy Companies involved
- Daymark’s audit experience
- Daymark’s standard of review used in the audit, and
- Report organization

### A. Case history

In August 2014, the Companies filed their fourth Electric Security Plan (“ESP IV”) with the Public Utilities Commission of Ohio (“Commission” or “The Commission”) in Case No. 14-1297-EL-SSO.<sup>14</sup> As part of the Third Supplemental Stipulation, filed in December 2015, the Companies committed to file within 90 days a grid modernization business plan.<sup>15</sup> The Companies filed their plan, titled the Grid Modernization Business Plan, in Case No. 16-481-EL-UNC in February 2016.<sup>16</sup>

Consideration of the Companies’ Grid Modernization Business Plan was suspended pending a coordinated effort by the Commission to review grid modernization projects, regulations, and policies in the state of Ohio. The effort culminated in a roadmap published on August 29, 2018.<sup>17</sup>

During the Commission’s review of grid modernization policies in the state of Ohio, the Companies filed a separate plan, titled the “Distribution Platform Modernization Plan” in Case No. 17-2436-EL-UNC.<sup>18</sup>

In November 2018, following the conclusion of the Commission’s grid modernization proceeding, the Companies filed a Stipulation which sought to resolve several

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<sup>14</sup> See Case No. 14-1297-EL-SSO, In the Matter of the Application of Ohio Edison, The Cleveland Electric Illuminating Company, and The Toledo Edison Company for Authority to Provide for a Standard Service Offer, 8/4/2014.

<sup>15</sup> See Case No. 14-1297-EL-SSO, Third Supplemental Recommendation and Stipulation, 12/1/2015, at 9.

<sup>16</sup> See Case No. 16-481-EL-UNC, In the Matter of the Grid Modernization Business Plan, 2/29/2016.

<sup>17</sup> <https://puco.ohio.gov/utilities/electricity/resources/ohio-grid-modernization>

<sup>18</sup> See Case No. 17-2436-EL-UNC, In the Matter of the Application for Approval of a Distribution Platform Modernization Plan, 12/1/2017.

proceedings, including Case Nos. 16-481-EL-UNC, 17-2436-EL-UNC, 18-1604-EL-UNC, and 18-1656-EL-ATA.<sup>19</sup> In part, the Stipulation outlined a program, Grid Mod I, which comprised plans by each of the operating companies to invest in a set of technologies which would deliver various benefits to customers.<sup>20</sup> The set of technologies included AMI, a Meter Data Management System (MDMS), DA, IVVC, and an Advanced Distribution Management System (ADMS).<sup>21</sup> The signatory parties to the Stipulation filed in November 2018 included Ohio Edison Company, The Cleveland Electric Illuminating Company, The Toledo Edison Company, Staff, Ohio Energy Group, Industrial Energy Users-Ohio, Direct Energy Services, LLC and Direct Energy Business LLC, Interstate Gas Supply, Inc., Ohio Hospital Association, Environmental Defense Fund, and Ohio Cable Telecommunications Association.<sup>22</sup>

In January 2019, the Companies filed a Supplemental Stipulation. The Supplemental Stipulation modified the allocation of customer credits associated with the Tax Cuts and Jobs Act of 2017 (“TCJA”) and modified aspects of Grid Mod I. The modifications to Grid Mod I included improvements to customer benefits and safeguards related to the Original Stipulation, and enhanced the Grid Mod collaborative process outlined in the Original Stipulation.<sup>23</sup> The Supplemental Stipulation included the original signatory parties as well as the Office of the Ohio Consumers’ Counsel, The Northeast Ohio Public Energy Council, and Ohio Partners for Affordable Energy.<sup>24</sup> These three parties were signatory parties to the supplemental stipulation with respect to all terms and conditions except the terms and conditions of Sections V.B. through V.I. of the original stipulation related to grid modernization, which they agreed not to oppose.<sup>25</sup>

In July 2019, the Commission approved and adopted the Stipulation with modifications.<sup>26</sup> The adopted Grid Mod I plan allowed for the Companies to recover

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<sup>19</sup> See Case No. 16-481-EL-UNC et al., Stipulation and Recommendation, 11/9/2018, at 1-2.

<sup>20</sup> Daymark notes for reference the peculiarity of the Stipulation process which resulted in the Grid Mod I program. Portions of this process were deemed confidential, most notably the Companies’ cost-benefit analysis workpaper. Information contained in the Companies’ cost-benefit analysis workpaper was foundational to our performing the present review.

<sup>21</sup> See Case No. 16-481-EL-UNC et al., Stipulation and Recommendation, 11/9/2018, at 10.

<sup>22</sup> See Case Nos. 16-481-EL-UNC et al., Testimony of Santino L. Fanelli, 11/9/2018 at 2.

<sup>23</sup> See Case Nos. 16-481-EL-UNC et al., Supplemental Testimony of Santino L. Fanelli, 1/25/2019 at 2.

<sup>24</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019, at ¶9.

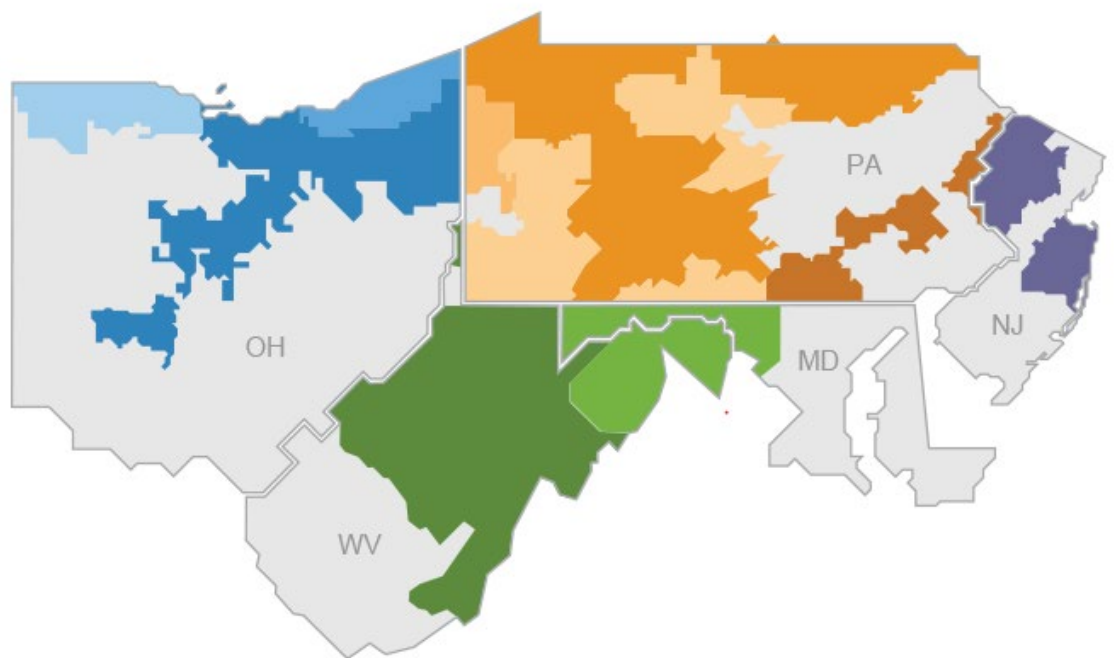
<sup>25</sup> *Id.*, at ¶70.

<sup>26</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019, at ¶1.

actual capital costs of up to \$516 million through Rider AMI as well as \$139 million of incremental O&M costs, including \$72.2 million for the retirement of non-AMI meters.<sup>27</sup>

## **B. FirstEnergy Corp. and the Ohio Companies**

FirstEnergy Corp. is a utility holding company headquartered in Akron, Ohio. Currently, FirstEnergy owns 10 distribution utilities that primarily operate in the states of Ohio, West Virginia, New Jersey, Maryland, and Pennsylvania.<sup>28</sup> Figure 1, from FirstEnergy's website, shows geographically where these territories are.



**Figure 1. FirstEnergy utilities' service territories<sup>29</sup>**

<sup>27</sup> *Id.*, at ¶¶30-32.

<sup>28</sup> These utilities include Ohio Edison, Toledo Edison, The Illuminating Company, Penn Power, West Penn Power, Met-Ed, Penelec, Jersey Central Power & Light, Mon Power, and Potomac Edison.

<sup>29</sup> FirstEnergy website, "About Us," accessed August 2022, available at: <https://firstenergycorp.com/about/utilities.html>.

This report focuses on the grid modernization investments, Grid Mod I, undertaken by the Ohio Companies<sup>30</sup> – Ohio Edison (OE), the Illuminating Company (CEI)<sup>31</sup>, and Toledo Edison (TE). While a significant portion of the activities pertinent to Grid Mod I occurred within the Companies, FirstEnergy did in some cases leverage experience with certain technologies from their other service territories.<sup>32</sup>

### C. Related audit efforts

In April of 2019, Daymark findings pertaining to a review of the operational benefits of a grid modernization deployment by AEP Ohio. The report can be found in Case No. 18-1618-EL-RDR. Daymark leveraged this background in performing the present audit scope.

Daymark in January 2022 filed a report on the matter of Rider DMR, which was collected by the Companies over a period from 2017-2019. The scope of the audit was to assess whether the funds were used directly or indirectly in support of grid modernization and Daymark's conclusions can be found within the report.<sup>33</sup>

The Opinion & Order in Case Nos. 16-481-EL-UNC et al. reiterates an audit process pertaining to Rider AMI that was established in the *ESP III* and *ESP IV* cases.<sup>34</sup> That audit covered a scope including on-site inspections of new capital assets, tracing capital expenses, verification of proper accounting, and more.<sup>35</sup> The present audit is related to the scope outlined in the March 2022 Request for Proposal and the associated context within the Opinion & Order.<sup>36</sup> We further discuss the scope and approach to this review in Section D below.

Work on the initial Grid Mod Consultant scope was performed by another firm between its selection in October 2021 and withdrawal in March 2022.<sup>37</sup> Daymark was provided

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<sup>30</sup> We tend to use the term “The Companies” throughout the report to refer to the actions of the Grid Mod I implementation groups as well as end users of the technologies collectively. The term “FirstEnergy” may also be used in parts of the report; our doing so is not to be construed as a judgment of organizational structure, cost allocation, or related concepts.

<sup>31</sup> Despite the legal name of this operating company, FirstEnergy refers to this company in its various Grid Mod I documentation by its former name and acronym Cleveland Electric Illuminating (CEI). Accordingly, we follow this convention within this report.

<sup>32</sup> PAC Set 1 DR 4.

<sup>33</sup> See Case No. 17-2474-EL-RDR, Rider DMR Audit Report Redacted, 1/14/2022.

<sup>34</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/12/2019 at ¶133.

<sup>35</sup> *Id.*

<sup>36</sup> See Case Nos. 16-41-EL-UNC et al., Entry Directing Staff to Issue a Request for Proposals, 3/9/2022.

<sup>37</sup> See Case Nos. 16-481-EL-UNC et al., Entry, 4/20/2022 at ¶12-13.

the set of Discovery Request questions and responses from that prior engagement as part of this audit. Daymark supplemented these Discovery Requests with questions and an investigation of its own.

#### **D. Standard of review**

Daymark formed its approach to this audit by examining the case history relating to the Companies' Grid Mod I, including the Commission's Request for Proposal RA21-GM-1. We supplemented this examination with our experience performing audits in state utility regulatory contexts.

Given the intent outlined for this audit, in conjunction with program requirements that were outlined by the Commission in its Opinion & Order, Daymark expected that: (1) the set of assumptions forming expectations for the program would be transparently represented; and (2) evidence would be provided by the Companies which comported with the projection method; such that (3) the auditor could make an objective determination as to whether the requirements of the order were being met, or, in the case of the operational savings, a determination as to the current and future level of savings to be achieved.

#### **Context for the audit scope of work**

##### **Excerpt from the Commission's Opinion & Order**

*Midway through the implementation period, Staff will perform an operational benefits assessment and a review or will obtain a consultant to conduct an operational benefits assessment and review, to be completed prior to the commencement of the Companies' next projected phase of grid modernization investments (Grid Mod II), to evaluate whether the actual functionality and performance of the project is consistent with the planned specifications. The consultant may also conduct an independent cost-benefit analysis for this project, which could include a review and possible increase or decrease to the level of operational savings credited to the revenue requirement of Rider AMI during Grid Mod I. The reviews shall also include an evaluation of the sufficiency and prudence of the Companies' efforts and calculations to maximize actual salvage or sale net proceeds, and the results of the evaluation may include a recommendation on the Companies' efforts to maximize actual salvage or sale net proceeds going forward. The results*

*of the reviews may also be incorporated into future deployment of the Companies' grid modernization investment to ensure the goals of the investments are being met. The cost of the consultant shall be recovered through Rider AMI, and such costs are not subject to the \$139 million cap. (Co. Ex. 3 at 5-6.)<sup>38</sup>*

Further, the Commission noted:

*While the Stipulation does place certain parameters around Grid Mod I that will protect customers during its implementation, we do agree with some of the concerns raised by Environmental Advocates, OMAEG, and Kroger. Most importantly, we recognize that the estimated net benefit projections are just that and Grid Mod I should have the requisite controls in place to routinely monitor the projected and resulting costs and benefits associated with its programs. We note that the Stipulation provides for the opportunity for the Staff, or a consultant for the Staff, to conduct an independent cost-benefit analysis for the project, midway through the implementation period, although the Stipulation does not require that this cost-benefit analysis be performed (Co. Ex. 1 at 22). We will not modify the Stipulation to require that this additional cost-benefit analysis be performed; however, we expect that it will be performed unless the actual results from the Grid Mod I are substantially consistent with the projections submitted by the Companies in this proceeding (while correcting for duplicative data points as discussed above). Accordingly, in the event that the additional cost-benefit analysis is not performed, we direct Staff, or its consultant, to file a notice in this docket explaining why the additional cost benefit analysis should not be performed.<sup>39</sup>*

#### **Excerpt from the Commission's RFP (RA21-GM-1)**

*...the Commission is seeking proposals to conduct an operational benefits assessment to evaluate whether the actual functionality and performance of the project are consistent with planned specifications as approved in the Stipulation. The auditor's review shall also estimate the dollar value and the timing of operational savings, as compared to the stipulated amounts currently being credited, and make recommendations for an*

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<sup>38</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/12/2019 at ¶44.

<sup>39</sup> *Id.*, at ¶121.

*ongoing level of operational savings to be achieved and recognized in rates as part of the annual rider filing.<sup>40</sup>*

### **Excerpt from Daymark's Proposal**

Daymark stated the following in its proposal to perform audit services which resulted in the present review:

*We understand PUCO's objective in this effort is to assist Staff in its review of the operational benefits of FirstEnergy Ohio's Grid Mod I projects as required under the Commission's Supplemental Stipulation and Recommendation in Case Nos. 16-481-EL-UNC, et al. The Stipulation provides that the consultant, retained by Staff, will 'evaluate whether the actual functionality and performance of the projects are consistent with planned specification.' Daymark understands that the consultant may conduct an independent cost-benefit analysis that could result in a recommendation concerning the revenue requirement of Rider AMI and a review of the Companies' efforts to maximize salvage proceeds.*

### **Daymark's engagement activities**

Daymark relied on its audit experience in cases before the Commission as well as experience from other jurisdictions in performing the Grid Mod I Operational Benefits audit. Daymark's engagement involved:

- Reviewing the record in Case Nos. 16-481-EL-UNC et al. to determine the circumstances pertaining to the approved Grid Mod I project;
- Reviewing the Discovery Request material associated with the prior Consultant's effort, as provided by the Companies (responses of FirstEnergy's to that Consultant's information requests);
- Drafting incremental and more detailed discovery questions and analyzing responses;
- Interviewing key FirstEnergy employees associated with varying aspects of the Grid Mod I planning, implementation, and reporting;
- Holding frequent check-in meetings with Commission Staff and FirstEnergy to coordinate and resolve open items; and
- The preparation of this report.

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<sup>40</sup> See Request for Proposal No. RA21-GM-1, 3/9/2022 at 3.



## Audit review areas

Daymark identifies five (5) areas of audit review and addresses in each of the sections included here our approach within the review process. The five areas of review include:

1. Project Functionality and Performance
2. Independent Cost Benefit Analysis
3. Operational Savings Credit
4. Salvage or Sale Net Proceeds
5. Future Deployment

Within each section we identify the language pertinent to the scope element as offered by the Commission and discuss our interpretation of such language and corresponding approach taken within our review.

### Project Functionality and Performance

***“[the consultant will] evaluate whether the actual functionality and performance of the project is consistent with the planned specifications”<sup>41</sup>***

Daymark interpreted the language above based on the context of the case history and general regulatory precedent.

Daymark interprets the term “project” to mean the entirety of the Grid Mod I investment. Daymark interprets the phrase “actual functionality and performance” to mean the outcomes which have occurred which relate to the implementation of the project technologies. Daymark interprets the phrase “consistent with the planned specifications” to mean the extent to which the outcomes align with the capabilities and usages of the technologies which were outlined throughout the Companies’ filings and most explicitly recounted in Section IV.B.3 of the Opinion & Order. Daymark notes that Sections IV.B.3.d, IV.B.3.e, and IV.B.3.g of the Opinion & Order specifically outline the Companies’ plans relating to the specific Grid Mod I technologies.

We note that Section IV.B.3.a included a finding that the Grid Mod I cost-benefit analysis produced a positive NPV, assuming 20 years of operation.<sup>42</sup> As noted above, Daymark interprets the planned specifications of the project to include the contents of Section IV.B.3 of the Opinion & Order, and therefore sought to evaluate the consistency of the

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<sup>41</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶44.

<sup>42</sup> *Id.*, at ¶29.

actual functionality and performance against what was outlined in the Grid Mod I cost-benefit analysis.

To determine consistency, Daymark sought to understand the documentation supporting key assumptions regarding the performance of the technologies from the time the investment was proposed as well as the Companies' efforts to utilize the technologies in a fashion that aligns with the plans presented.

Daymark sought to fully understand the planned specifications of Grid Mod I by reviewing the Companies' several grid modernization filings and associated testimony as recounted in II.A above. Particular focus was given to the plan within the Stipulation which was eventually approved within the Opinion & Order.

Other important sources Daymark relied on for analysis of the planned specifications of Grid Mod I included the Grid Mod Collaborative slide decks and the Grid Mod I cost-benefit analysis that supported the Grid Mod I plan in the Stipulation. Daymark also submitted a large volume of discovery requests aimed at enhancing our understanding of the sources which supported the cost-benefit analysis.

To assess the functionality and performance of the project, Daymark relied on several sources of data, including the stipulated Grid Mod I Reporting Metrics, information from interviews, and supplemental data from discovery requests.

### **Independent Cost-Benefit Analysis**

*"The consultant may also conduct an independent cost-benefit analysis for this project..."<sup>43</sup>*

*"We note that the Stipulation provides for the opportunity for the Staff, or a consultant for the Staff, to conduct an independent cost-benefit analysis for the project, midway through the implementation period, although the Stipulation does not require that this cost-benefit analysis be performed (Co. Ex. 1 at 22). We will not modify the Stipulation to require that this additional cost-benefit analysis be performed; however, we expect that it will be performed unless the actual results from the Grid Mod I [sic] are substantially consistent with the projections submitted by the Companies in this proceeding (while correcting for duplicative data points as discussed above). Accordingly, in the event that the additional cost-benefit analysis is not*

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<sup>43</sup> *Id.*, at ¶144.

*performed, we direct Staff, or its consultant, to file a notice in this docket explaining why the additional cost benefit analysis should not be performed.”<sup>44</sup>*

#### **Daymark Independent CBA Standard of Review**

To understand the standard of review regarding the independent cost-benefit scope, Daymark reviewed the Commission’s discussion of the issue in Section IV.C.2.e. (¶¶97-¶¶122) of the Opinion & Order.

Daymark notes that it was able to determine, based on the evidence received from the Companies, that the actual results were not substantially consistent with the projections as noted in ¶¶121 of the Opinion & Order, and therefore we addressed the independent cost-benefit analysis scope.

Daymark notes that in ¶¶121 of the Opinion & Order the Commission connects the independent cost-benefit analysis with monitoring the projected and resulting costs and benefits associated with its programs. The projected costs and benefits for the programs were predicated on a set of assumptions. Daymark notes that the timing of this review allows for only a limited analysis of resulting benefits, especially given that operating experience with certain technologies and benefit streams have been short.

Daymark notes that there was no evidence or testimony that contested the projected costs of Grid Mod I.<sup>45</sup> Daymark does in the body of the report address cost aspects of the cost/benefit analysis, but per the context provided in the Opinion & Order, placed a strong focus on the projected and resulting benefits.

To satisfy the intent outlined in the cost-benefit analysis section of the Opinion & Order and adhere to typical regulatory practice, Daymark approached the independent cost-benefit analysis with the intent of identifying the sources of all assumptions associated with the Grid Mod I cost-benefit analysis workpapers.

Daymark encountered substantial barriers to evaluating the assumptions contained within the Grid Mod I cost-benefit analysis. The Grid Mod I cost-benefit analysis workpaper took inputs from additional spreadsheets associated with the Companies’ prior Grid Modernization Business plan filings. Despite our communications since the start of the audit stating our intent to investigate the cost-benefit analysis, these additional spreadsheets were not made available to Daymark until August 17, 2022. The

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<sup>44</sup> *Id.*, at ¶¶121.

<sup>45</sup> *Id.*, at ¶¶112.

Grid Modernization Business Plan spreadsheets contained undocumented assumptions which informed the operational savings and other benefits in the Grid Mod I cost-benefit analysis.

Where properly documented assumptions existed within the Grid Mod I cost-benefit analysis, Daymark in cases found a lack of pertinent documentation to perform an objective assessment of the achieved benefits in relation to those projected benefits.

### **Operational Savings Credit**

***“[the independent cost-benefit] could include a review and possible increase or decrease to the level of operational savings credited to the revenue requirement of Rider AMI during Grid Mod I.”<sup>46</sup>***

***“the auditor’s review shall also estimate the dollar value and the timing of operational savings, as compared to the stipulated amounts currently being credited, and make recommendations for an ongoing level of operational savings to be achieved and recognized in rates as part of the annual rider filing.”<sup>47</sup>***

Stipulated operational savings were put forth in Attachment D of the Companies’ November 2018 Stipulation filing. The Stipulation’s Attachment D contains the breakdown of the technologies and operational savings categories that lead to the total annual savings being credited. Daymark notes that the stipulated operational savings were based on the Grid Mod I cost-benefit analysis workpaper.

To compare the dollar value and timing of operational savings to stipulated amounts, it is necessary to have a clear understanding of the elements that compose those stipulated amounts. As noted previously in our discussion of the independent cost-benefit analysis scope item, Daymark was unable to perform what in our regulatory experience would be an adequate review of the assumptions that informed the projections of operational savings.

The Stipulation contemplates that, if there is no adopted recommendation from this review, then the deemed annual Operational Savings would continue based on Attachment D for Years 4-6.<sup>48</sup> The Opinion & Order does not explicitly discuss the going-

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<sup>46</sup> *Id.*, at ¶44.

<sup>47</sup> See Request for Proposal No. RA21-GM-1, 3/9/2022 at 3.

<sup>48</sup> See Case Nos. 16-481-EL-UNC et al., Stipulation and Recommendation, 11/9/2018 at 23-24.

forward operational savings in absence of an adopted recommendation based on this review in its discussion of crediting of operational savings in ¶45.

The metrics being tracked by the Companies and supplemental data that were made available were not sufficient for the purposes of calculating a dollar savings that has been achieved through implementation or that would be expected to be achieved going forward. We recommend in this report a revisitation and revision of the metrics, along other programmatic changes to better allow for tracking of operational benefits.

### Salvage or Sale Net Proceeds

*“The reviews shall also include an evaluation of the sufficiency and prudence of the Companies’ efforts and calculations to maximize actual salvage or sale net proceeds, and the results of the evaluation may include a recommendation on the Companies’ efforts to maximize actual salvage or sale net proceeds going forward.”<sup>49</sup>*

Daymark reviewed data pertaining to salvage and sale net proceeds made available by the Companies. We conclude that the Companies’ efforts were sufficient and prudent and therefore do not have any recommendations as to actions to maximize salvage or sale net proceeds going forward.

### Future Deployment

*“The results of the reviews may also be incorporated into future deployment of the Companies’ grid modernization investment to ensure the goals of the investments are being met.”<sup>50</sup>*

Daymark throughout the report recommends additional reporting metrics, revised reporting metrics, stronger incentives, and similar improvements with the aim of better achieving the goals of the grid modernization investment.

## E. Report organization

Daymark has chosen to structure the remainder of this audit report in the following way:

- **Section III - Grid Mod I Reporting Metrics:** In this section, Daymark reviews the Grid Mod I reporting metrics. The Grid Mod I reporting metrics were the primary evidence of benefit achievement provided to Daymark, and we found them insufficient for evaluating operational and non-operational benefits. As a conclusion within this section, we offer a table of proposed improved metrics to

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<sup>49</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019, at ¶44.

<sup>50</sup> *Id.*

be used as a starting point for better tracking implementation so as to transparently demonstrate benefit achievement.

- **Section IV - Programmatic Analysis:** In this section, Daymark analyzes the requirements outlined for the Grid Mod I program in the Stipulation and Opinion & Order. We note that within the Opinion & Order that there was a strong focus on “implementation”<sup>51</sup> activities.
- **Section V – Independent Cost-Benefit Analysis:** In this section, Daymark discusses the Grid Mod I cost-benefit analysis, and in particular its suitability to be used in an audit context. We comment specifically on program costs, timing of benefit achievements in relation to projections, and the sources of assumptions behind projections of costs and benefits. We chose to place this discussion ahead of the discussion of benefits as it forms essential context for the discussion of program benefits.
- **Section VI – Benefits Analysis:** In this section, Daymark identifies, for operational and non-operational benefits, areas in which the set of benefits needs improvement in terms of tracking and achievement. We offer remedies that might correct for these underlying issues. Finally, we summarize takeaways for both the operational benefits and non-operational benefits categories.
- **Section VII – Findings and Recommendations:** In this section, Daymark reiterates the top-level findings from the Executive Summary and offers takeaways pertaining to metrics and reporting and individual technologies and benefit streams based on our review activities.

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<sup>51</sup> By implementation, we mean that requirements are focused on procedural steps, such as ensuring that a circuit selection process is performed and that technologies be installed on a certain number of circuits or customer premises. By contrast, there is a relatively lesser discussion within the Opinion & Order of the benefits to be achieved by the Grid Mod I deployment.

### III. GRID MOD I REPORTING METRICS

#### A. Background

Per the Stipulation and Opinion & Order the Companies were obligated to measure the status of deployment and related impacts of grid modernization investments with a set of metrics. The metrics collected by the Companies were to be included in the workpapers submitted to Staff in support of the Rider AMI quarterly updates. Metrics include but are not limited to the number of certified AMI meters, the number of customers within each class with such meters shopping each month, customers with AMI meters subject to disconnection or tampering charges, circuit information for circuits equipped with DA and whether DA operated as expected monthly, ADMS utilization metrics, and IVVC energy efficiency metrics.<sup>52</sup> A full list of the existing set of forty-seven metrics can be found in Appendix 6 – Current Grid Mod I Reporting Metrics.

#### B. Importance of metrics within Grid Mod I

Metrics are key to demonstrating the achievement of assumed benefits, operational or otherwise. This is especially the case in capital intensive and complex efforts like Grid Mod I, where the utility might become focused on deployment and integration activities (outputs), rather than the final goals (outcomes) these activities are aimed at achieving.

For the purposes of assessing the cost effectiveness of Grid Mod I and estimating the operational savings being achieved, the metrics as they exist currently are insufficient. The existing metrics gather primarily indirect data, which, combined with the nontransparent assumptions within the confidential Stipulation documents, results in a situation where evidence and assumptions are not adequately documented for audit purposes.

Absent transparent, clearly defined, and benefit-focused metrics, there is no way to determine the extent to which projected program benefits are being achieved, and to date, FirstEnergy has not demonstrated that program benefits are being achieved consistent with projections. In Section III.D - Suggested metrics improvements, Daymark offers a number of suggested benefit-driven metrics for consideration moving forward; these metrics we believe are essential to assuring the benefits claimed are consistently measured and achieved. The Commission should require FirstEnergy to address these concerns before allowing incremental investment.

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<sup>52</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶43.

### C. Metrics process analysis

Daymark reviewed the history of the set of performance metrics utilized throughout the Grid Mod I implementation that led up to the preparation of this report. The metric spreadsheet provides monthly data for the categories. Some metrics are reported on a “deployment area” basis, while others are reported on a “company-wide” basis.

For some metrics categories, data was reported going back to June 2019 for reference; however, metrics for many of the Grid Mod I indicators began to be populated at different points throughout 2020 as implementation activities started. The first metric report was submitted in September 2019, and subsequent Grid Mod I metric reports were submitted quarterly, with information reported as of the end of the most recently completed quarter.<sup>53</sup> The quarterly report breaks the metrics down by AMI/Meter Metrics, DA Metrics, and IVVC metrics, which is in alignment with the obligations in the Opinion & Order. The existing metric categories are provided in Appendix 6 – Current Grid Mod I Reporting Metrics for reference.

Different business units and contacts within those business units who are responsible for reporting internally the data for different metric categories to the regulatory group.<sup>54</sup> Throughout the interviews we conducted, we noted that there was no feedback process<sup>55</sup> associated with metrics collection. Interviewees were unable to produce examples where the metrics collection process was used to flag and correct deficiencies in achieving benefits or in project deployment.

Daymark noted several metrics categories<sup>56</sup> for which no data has been presented to date. We understand that some metrics categories require the ADMS to have been launched; given the August 16, 2022, advanced application enablement date, we would expect presentation of these metrics categories going forward.

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<sup>53</sup> PAC Set 1 DR 26.

<sup>54</sup> Set 2 DR 3 Attachment 1.

<sup>55</sup> At its simplest, a feedback process might involve the owner(s) of the collection process identifying where metrics reflect a reality which diverges from plans (either lagging or accelerated) and providing communications, if deemed to be necessary, throughout the organization.

<sup>56</sup> Metrics categories include: #37 the number of DA circuits that are fully functional based on integration with the ADMS, #43 IVVC MW saved, #44 IVVC MWh saved, and #47 IVVC greenhouse gas reduction.



Daymark observed that the Companies have generally not tracked any Grid Mod I data related to the status of the technologies in delivering benefits aside from the requirements of the metrics indicated in the Stipulation.<sup>57 58</sup>

While FirstEnergy has generally met its obligation to report on the established Stipulation metrics, Daymark has concerns in two areas:

First, there is a lack of focus on providing feedback relative to what the metrics indicate. FirstEnergy failed to establish milestone targets for a significant portion of the metrics<sup>59</sup>. As a result, there is little information available to reviewers of the metric reports on whether progress was ahead of or behind schedule.

Second, the metrics established do not track operational savings. For future deployments, Daymark recommends the establishment of target operational savings levels which reflect the planned pace of deployment so that reviewers can directly monitor operational savings achieved and so that corrections can be made to address pace and track benefits achievement. Daymark recommends that in categories where the Companies are lagging such target levels, they be required to provide a detailed explanation and outline actions being taken to correct the delay. Daymark also acknowledges that there may exist scenarios in which benefits exceed theoretical target levels, in which case such outcomes can inform program design.<sup>60</sup> Daymark suggests refined and additional metric categories in the subsection below to support more accurate tracking of benefits achievement progress.

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<sup>57</sup> As examples, Companies have not collected the data which could be used to evaluate AMI impacts on customer call handle times and have not collected data which directly represent operational savings from the AMI deployment.

<sup>58</sup> The Companies provided data in materials such as the Collaborative Group decks (PAC Set 1 DR 31 and Set 4 DR 28) and internal weekly Grid Mod I implementation updates. While Daymark acknowledges that the former in particular provides some added color to, for example, the DA event benefits, we note that these sets of material were largely focused on explaining implementation status of the technologies and generally did not include detailed discussion of data which would reflect performance of the installed technologies.

<sup>59</sup> PAC Set 3 DR 31.

<sup>60</sup> Daymark by this refers generically to performance based ratemaking concepts, where a policy decision typically would be made concerning such issues. We offer in this report that such concepts, which are referenced in the PowerForward Roadmap, may serve to better align incentives regarding benefit achievement. We have considered a detailed treatment of performance based ratemaking concepts within grid modernization deployments to be beyond the scope of this audit.

## D. Suggested metrics improvements

Daymark includes in Table 1 a list of suggested metrics that would better facilitate program benefits tracking. Daymark notes the following important caveats relative to this list of suggested metrics:

- These metrics should be considered in conjunction with simplification and clarification of the benefit projection methods used in considering future grid modernization phases.
- Many of the largest benefit categories are subject to significant influence by confounding factors.<sup>61</sup> The utility, as the collector and possessor of the relevant information, is in the best position to take steps to control for these confounding factors. Daymark suggests that a revised recovery mechanism whereby the utility is responsible for demonstrating benefits in order to achieve a specified level of return may incentivize more proactive and accurate demonstration of benefits achievement.<sup>62</sup>
- We are not able to propose metrics for two benefit categories, due to the lack of transparency supporting the projection method.<sup>63</sup> Our omission of suggested metrics for these categories is not to be construed as approval of the current state of evidence and tracking. Rather, we strongly urge the parties to revisit these categories to reestablish what the benefit category represents and how it might be transparently and objectively tracked.

**Table 1. Suggested reporting metrics**

BENEFIT CATEGORY	SUGGESTED METRIC(S)	NOTES
Time-Varying Rates	<ul style="list-style-type: none"> <li>• Total energy savings, customers taking TVR</li> <li>• Total capacity savings, customers taking TVR</li> </ul>	<ul style="list-style-type: none"> <li>• Statistical treatment needed, recommended to build on CEI methodology</li> <li>• Policy treatment of CRES offering needed</li> </ul>
Customer Energy Management	<ul style="list-style-type: none"> <li>• Total energy savings, CEM participants</li> <li>• Total capacity savings, CEM participants</li> </ul>	<ul style="list-style-type: none"> <li>• Statistical treatment needed, recommended to build on CEI methodology</li> </ul>
DA Reliability Improvements (Normal and Storm)	<ul style="list-style-type: none"> <li>• SAIDI/SAIFI (Normal and Storm) for the set of circuits receiving DA</li> </ul>	<ul style="list-style-type: none"> <li>• Comparison to the five-year averages of the set of circuits which received DA will be important to determine the extent to which DA has improved</li> </ul>

<sup>61</sup> For example, the effects of weather on DA or IVVC results.

<sup>62</sup> As noted earlier, a discussion of performance based ratemaking concepts is beyond the scope of this review.

<sup>63</sup> Benefit categories subject to this inadequacy include revenue assurance and service outage management.

BENEFIT CATEGORY	SUGGESTED METRIC(S)	NOTES
	<ul style="list-style-type: none"> <li>SAIDI/SAIFI (Normal and Storm) for a selected set of circuits with similar characteristics for comparison</li> </ul>	<p>outcomes on those circuits, but is most subject to randomness</p> <ul style="list-style-type: none"> <li>Comparison to peer circuits will strip out some randomness within the measurement time period, but its usefulness depends on identification of suitable comparison circuits.</li> </ul>
Platform Reliability Improvements	<ul style="list-style-type: none"> <li>SAIDI/SAIFI for the set of circuits receiving platform improvements</li> <li>Ongoing SAIDI/SAIFI for a selected set of circuits with similar characteristics (pre-platform upgrade) for comparison</li> </ul>	<ul style="list-style-type: none"> <li>Comparison to the five-year averages of the set of circuits which received platform improvements will be important to determine the extent to which platform improvements have improved outcomes on those circuits, but is most subject to randomness</li> <li>Comparison to peer circuits will strip out some randomness within the measurement time period, but its usefulness depends on identification of suitable comparison circuits.</li> </ul>
IVVC – Energy Savings	<ul style="list-style-type: none"> <li>MWh saved due to IVVC – see note</li> </ul>	<ul style="list-style-type: none"> <li>MWh saved due to IVVC is an existing metric category. However, FirstEnergy has neither presented data in this category nor presented its methodology for doing so. We include this metric here to urge that such a methodology reflects voltage and current measurements on the IVVC circuits and utilizes a transparent and sound statistical approach.</li> </ul>
IVVC – Capacity Savings	<ul style="list-style-type: none"> <li>MW saved due to IVVC – see note</li> </ul>	<ul style="list-style-type: none"> <li>MW saved due to IVVC is an existing metric category. However, FirstEnergy has neither presented data in this category nor presented its methodology for doing so. We include this metric here to urge that such a methodology reflects voltage and current measurements on the IVVC circuits and utilizes a transparent and sound statistical approach.</li> </ul>
AMI – Meter Reading	<ul style="list-style-type: none"> <li>Meter reader manager and supervisor counts</li> </ul>	<ul style="list-style-type: none"> <li>Represents an expansion to existing metrics #10-11. The Companies have indicated that their meter reading savings projections included roles beyond meter readers; if these are to be considered savings they should be reported within the metrics</li> </ul>
AMI – Meter Services	<ul style="list-style-type: none"> <li>Meter services employee counts</li> <li>Meter services manager/supervisor counts</li> </ul>	<ul style="list-style-type: none"> <li>Daymark notes the comparatively small number of FTE savings as compared to meter reading. We offer that until FirstEnergy can present evidence that the meter services employee counts have been reduced as a result of the AMI deployment (or alternatively that it has had a budgetary impact), that the benefit cannot be said to have been realized.</li> </ul>
AMI – Back Office	<ul style="list-style-type: none"> <li>Back office employee counts</li> <li>Back office manager/supervisor counts</li> </ul>	<ul style="list-style-type: none"> <li>Daymark notes the comparatively small number of FTE savings as compared to meter reading. We offer that until FirstEnergy can present evidence that the back office employee counts have been reduced as a</li> </ul>

BENEFIT CATEGORY	SUGGESTED METRIC(S)	NOTES
		result of the AMI deployment (or alternatively that it has had a budgetary impact), that the benefit cannot be said to have been realized.
AMI – Call Center	<ul style="list-style-type: none"> <li>Call center employee counts</li> <li>Call center manager/supervisor counts</li> <li>Average call handle time for call types which were flagged for improvement under AMI deployment, AMI customers versus non-AMI customers.<sup>64 65</sup></li> </ul>	<ul style="list-style-type: none"> <li>Daymark notes the comparatively small number of FTE savings as compared to meter reading. We offer that until FirstEnergy can present evidence that the call center employee counts have been reduced as a result of the AMI deployment (or alternatively that it has had a budgetary impact), that the benefit cannot be said to have been realized.</li> </ul>
DA – Operational Savings (All)	<ul style="list-style-type: none"> <li>O&amp;M crew FTE counts</li> <li>O&amp;M crew overtime hours</li> </ul>	<ul style="list-style-type: none"> <li>Due to the relative size of savings and prevalence of labor in driving savings, Daymark suggests that FTE counts and overtime hour counts are the only adequate measure of progress for this class of benefits. Daymark notes the Companies’ response to Set 4 DR 16 – while greater efficiencies and safety are enviable and may be outcomes of the deployment, these parameters are not conducive to measurement and thus are inappropriate to include within a cost-benefit analysis.<sup>66</sup></li> </ul>
ADMS Operational Savings	<ul style="list-style-type: none"> <li>O&amp;M annual budget and variance – Dispatch</li> <li>O&amp;M annual budget and variance – Training</li> </ul>	<ul style="list-style-type: none"> <li>Given the projection method, the most appropriate evidence to be used to understand the ADMS operational savings is budgetary figures. Simply put, if actual budgetary figures pertaining to the represented categories have not decreased, then this operational savings has not been delivered upon.</li> </ul>

<sup>64</sup> Daymark understands from its interviews and Set 3 DR 23 that reporting on such a metric would require the call center to note an additional detail which is not done under their process today.

<sup>65</sup> We refer to the Companies’ AMI business case, Set 3 DR 13 Attachment 1, for how the Companies formed an expectation of which call types would benefit from the AMI deployment.

<sup>66</sup> Daymark offers that there may be additional outcomes associated with the set of grid modernization technologies which are not conducive to being represented in cost-benefit analyses. If this is taken to be the case, Daymark suggests that this is cause to consider supplemental, narrative, showings of the benefit of the technologies to be utilized alongside cost-benefit analyses.

## IV. PROGRAMMATIC ANALYSIS

The following section contains an analysis of the program requirements which were established within the Stipulation, Supplemental Stipulation, and Opinion & Order. In large part, the program requirements pertain to what Daymark is considering “implementation” activities; language pertaining to the achievement of benefits through the investment is present within the Opinion & Order but more indirectly discussed.

Daymark tabulates below the passages of the Opinion & Order which in its view form the basal requirements, or obligations, of the Grid Mod I program. In the farthest right column, we indicate the report section in which each requirement is discussed.<sup>67</sup>

**Table 2. Grid Mod I Opinion & Order language summary**

<b>¶ in Opinion &amp; Order</b>	<b>OBLIGATION</b>	<b>REPORT SECTION</b>
<b>¶30</b>	“Grid Mod I will be constructed over a three-year period”	IV.A Schedule
<b>¶35</b>	“The Companies will create and facilitate a grid modernization collaborative working group (Collaborative Group) ...to update stakeholders on the status of the project throughout implementation of the Grid Mod plans and to provide for customer input and advice”	IV.B Collaborative working group
<b>¶36</b>	“The Companies will install 700,000 advanced meters along with the necessary supporting communications infrastructure, a MDMS, and associated systems and processes. The Companies will also provide a map of where AMI is being deployed with dates of deployment and an AMI tag on the Customer Information List provided to CRES providers.”	IV.C AMI/MDMS
<b>¶37</b>	“The Companies will also implement data access enhancements for customers and CRES providers...”	IV.C AMI/MDMS
<b>¶38</b>	“Within six months of an Opinion and Order in these proceedings, and after consultation with the Collaborative Group, the Companies will propose a time-varying rate offering for non-shopping customers...”	IV.C AMI/MDMS
<b>¶38</b>	“Within six months of the Opinion and Order in these proceedings, the Companies will meet with the Collaborative Group and subsequently submit a plan to Staff detailing the time-varying rate options it reasonable believe will be offered to retail customers by CRES providers”	IV.C AMI/MDMS
<b>¶40</b>	“The Companies will install DA on at least 200 circuits...after collaborating with Staff to identify and select the circuits for DA and IVVC investments in order to maximize customer benefits”	IV.D Distribution

<sup>67</sup> Note: The analysis of ¶43, which pertains to the metrics process, is addressed separately in Section III due to its importance within the benefit review charge of this audit.

¶ in Opinion & Order	OBLIGATION	REPORT SECTION
		Automation (DA)
¶40	"[The Companies will install] IVVC on at least 202 circuits, after collaborating with Staff to identify and select the circuits for DA and IVVC investments in order to maximize customer benefits"	IV.E IVVC
¶40	"DA deployment in conjunction with ADMS will improve reliability and outage management"	IV.D Distribution Automation (DA)
¶40	"IVVC deployment in conjunction with ADMS will optimize voltage management"	IV.E IVVC
¶40	"The Companies will work with the Signatory Parties to identify best practices and utilize technologies to achieve energy savings associated with the deployment of IVVC with the objective of achieving four percent energy savings when Grid Mod I technologies are fully deployed."	IV.E IVVC
¶41	"The Companies agree to file an application under Ohio Adm. Code 4901:1-10-10(B)(7) to revise their reliability performance standards established in Case No. 09-759-EL-ESS, within six months of the issuance of a final Opinion and Order in these cases, and again within a year after Grid Mod I deployment is completed (Co. Ex. 1 at 21)."	IV.D Distribution Automation (DA)
¶42	"The Companies will install an ADMS, which will be designed to support a broad range of current and future distribution management and optimization, including, but not limited to: fault isolation and system restoration, integration of DER, use of the information in distribution planning efforts, more efficient utility operation and planning actions, and integration with existing and future utility investments, including MDMS and supervisory control and data acquisition (SCADA) system (Co. Ex. 1 at 21)."	IV.F ADMS
¶43	"The Companies and Staff agree that a set of performance metrics will measure the status of deployment and related impacts from grid modernization investments..."	III Grid Mod I Reporting Metrics

In the subsections below, Daymark recaps the language from the Commission Order which results in a FirstEnergy obligation pertaining to the Grid Mod I deployment, offers interpretations of the obligations as necessary, and analyzes evidence which it reviewed to understand FirstEnergy's status in meeting the obligation.

## A. Schedule

**Obligation:** The Companies were to, per the Stipulation and Opinion and Order, construct Grid Mod I over a three-year budget period.<sup>68</sup>

While not specifically discussed in the Opinion & Order, the Grid Mod I cost-benefit analysis<sup>69</sup> implied a certain pace of rollout of technologies over the three-year period:

- **AMI** – The Companies expected to install 700,000 advanced meters by Year 3. The cost-benefit analysis suggests the following as a pace: Year 1 – 112,100; Year 2 – 284,400; and Year 3 – 303,500.
- **DA** – The Companies expected to install 200 DA circuits by Year 3. The cost-benefit analysis suggests a pace of Year 1 – 67; Year 2 – 67; and Year 3 – 67.
- **IVVC** – The Companies expected to install 202 IVVC circuits by Year 3. The cost-benefit analysis suggests a pace of Year 1 – 67; Year 2 – 67; and Year 3 – 67.
- **ADMS** – At the time of the cost-benefit analysis, the Companies expected the ADMS system to be ready and installed by Year 4. The Companies proposed an ADMS launch timeline in the February 27, 2020 Collaborative Deck, which had a platform go-live in Q2 of 2022 and deployment of the advanced applications occurring in Q3 2022.<sup>70</sup>

**Analysis:** The Companies were envisioning successful completion of Grid Mod I physical asset investments by September 1, 2022, as of the date of the response to PAC’s Set 1 DR 15.<sup>71</sup>

As of the August 8, 2022, Collaborative Presentation, FirstEnergy had deployed 706,545 advanced meters, accounting for 99% of their planned AMI installation. Regarding DA, FirstEnergy had completed installation of the technology on 206 circuits, or 100% of the planned installation; 94% of the circuits had their communications operational. Regarding IVVC, FirstEnergy had completed installation of the technology on 209 circuits, or 100% of the planned installation; 95% of the IVVC circuits had their communications operational.<sup>72</sup>

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<sup>68</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶70.

<sup>69</sup> PAC Set 1 DR 3 Attachment 2 Confidential.

<sup>70</sup> PAC Set 1 DR 31 Attachment 2.

<sup>71</sup> PAC Set 1 DR 15.

<sup>72</sup> Set 4 DR 28 Attachment 1.

Table 3 organizes the pace of technology implementation for the three aforementioned technologies. It is provided in total for FirstEnergy and broken down by each operating company.

**Table 3. Technology Implementation timeline summary**

ENTITY	TECHNOLOGY	Running total device counts as of collaborative date		
		AUG-2020 <sup>73</sup>	SEP-2021 <sup>74</sup>	AUG-2022 <sup>75</sup>
<b>FirstEnergy (Total)</b>	AMI	<b>72,859</b>	<b>511,208</b>	<b>706,545</b>
	DA	<b>0</b>	<b>32</b>	<b>209</b>
	IVVC	<b>0</b>	<b>1</b>	<b>206</b>
Ohio Edison	AMI	39,750	226,068	277,881
	DA	0	18	90
	IVVC	0	0	85
Cleveland Electric Illuminating	AMI	16,599	160,460	300,902
	DA	0	14	88
	IVVC	0	1	90
Toledo Edison	AMI	16,510	124,680	127,762
	DA	0	0	31
	IVVC	0	0	31

The Companies developed two schedules, a current schedule and a baseline schedule. The schedules reflect the number of devices for each technology (i.e., capacitor banks, reclosers, regulators, meters, connected grid routers, and range extenders) installed or planned to be installed on a month-to-month basis. The baseline schedule for meters was established in August 2019, while the baseline schedule for the remaining devices was not established until April 2021 when orders were created for the specific work types.<sup>76 77</sup>

As noted above, the Collaborative updates were used as a primary source for understanding the pace at which the Companies deployed each of the Grid Mod I technologies. As part of the quarterly meetings, the Companies prepared several slides of “Deployment Updates”, which showed, in part, a “Plan on a Page” (yearly schedule for substations, DA/VVO circuits, and network/communication circuits in process, as well as meter, connected grid router, and range extender deployments), deployment maps, and

<sup>73</sup> PAC Set 1 DR 31 Attachment 4.

<sup>74</sup> PAC Set 1 DR 31 Attachment 8.

<sup>75</sup> Set 4 DR 28 Attachment 1.

<sup>76</sup> PAC Set 1 DR 2.

<sup>77</sup> PAC Set 1 DR 2 Attachment 1.



number of circuits complete.<sup>78</sup> The Companies began holding a weekly internal Ohio Grid Mod I Implementation Update meeting in January 2022.<sup>79</sup> The slide decks for these meetings contained granular reporting on aspects such as implementation progress, including circuit updates, financial updates, adjusted schedules, material availability issues, ADMS progress, and communications status.<sup>80</sup>

Daymark identified several factors which were listed in the Companies' various Grid Mod I reporting materials which may have explained certain variances in their deployment of the technologies. The Companies in their May 27, 2020 Collaborative deck outlined the impact of COVID-19 on the Grid Mod I deployment.<sup>81</sup> The pandemic had the greatest impact on their deployment of advanced meters; the Companies were required to modify processes to eliminate face-to-face contact with customers. The Companies also kept stakeholders in the Collaborative groups informed of material supply issues, for example relaying guidance from their key advanced meter vendor in the September 29, 2021 deck.<sup>82</sup> The Companies have been tracking additional issues that at the time may have had schedule implications as part of their weekly meetings.<sup>83</sup> Examples of issues discussed in these meetings include material availability of Lindsey voltage sensors and testing failures in the Toledo Edison territory.<sup>84</sup>

In Daymark's analysis, the Companies have largely demonstrated that they have installed<sup>85</sup> the requisite number of Grid Mod I technologies in the three-year timeframe outlined in the Opinion & Order. As of the most recent deployment update, a small number of communications issues are all that remain to support the implementation of the device scopes.

Through its review of the schedule and pace of the technology deployment, Daymark noted a timing discrepancy between the cost-benefit analysis and the actual

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<sup>78</sup> PAC Set 1 DR 31 Attachments 1-10.

<sup>79</sup> Set 2 DR 2.

<sup>80</sup> Set 2 DR 2 Attachments 1-16.

<sup>81</sup> PAC Set 1 DR 31 Attachment 3.

<sup>82</sup> PAC Set 1 DR 31 Attachment 8.

<sup>83</sup> Daymark notes a key distinction between the process described here and our identification of a lack of tracking and feedback described in Section III: the weekly meetings were in our assessment exclusively focused on implementation activities while the shortcomings described in Section III related to tracking and feedback regarding benefit achievement.

<sup>84</sup> Set 2 DR 2 Attachment 16.

<sup>85</sup> Daymark here uses "installed" in a narrow sense; much of the Companies' reporting on technology deployment appears to relate to devices being connected in the field and at most, being commissioned within the Companies' communication networks.

deployment. FirstEnergy has offered explanations as to why certain discrepancies have occurred. The implications of this timing discrepancy will be discussed further in the independent cost-benefit analysis that follows in Section V.

## **B. Collaborative working group**

**Obligation:** Per the Stipulation and Opinion & Order, the Companies were required to create and facilitate a grid modernization collaborative working group. The purpose of the group was to update stakeholders on the status of the projects throughout implementation and provide for customer input and advice. Additionally, the Companies were to facilitate a group to gather stakeholder input associated with data access systems and processes.<sup>86</sup>

**Analysis:** Daymark reviewed the presentation files from each of the Ohio Grid Mod I Collaborative Meetings held from November 2019 through August 2022.<sup>87 88</sup> Collaborative Group meetings were held on 11/13/2019, 2/27/2020, 5/27/2020, 8/31/2020, 12/3/2020, 3/11/2021, 6/15/2021, 9/29/2021, 1/13/2022, 4/21/2022, and 8/8/2022.

FirstEnergy has documented the attendees at the Collaborative Meetings; attendees have tended to include representatives of the Companies, PUCO, OCC and NOPEC (the named parties in ¶35 of the Opinion & Order), CRES providers, trade groups, and smart technology advocates.<sup>89 90</sup>

The content of the presentation files varied from meeting to meeting. In our review of the set of presentation files, we observed the following topics being covered (non-exhaustive): Grid Mod I background and overview, technology overviews, program organization, data access overviews, time varying rates, circuit selection, deployment updates (schedules, maps, metrics), data access progress, ADMS schedule, outage event DA operation analyses, home area network, customer portal, advanced app (DA/VVO) testing status, and VVO pilot status.

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<sup>86</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶35.

<sup>87</sup> PAC Set 1 DR 31 Attachments 1-10.

<sup>88</sup> Set 4 DR 28 Attachment 1.

<sup>89</sup> Set 2 DR 5 Attachment 1.

<sup>90</sup> Classifications of attendees by Daymark.

Daymark attended virtually the Collaborative meeting held on August 8, 2022. We noted that there were opportunities for participants to ask questions of the FirstEnergy attendees who spoke to the various segments within the presentation.

Per our analysis, there is ample evidence that the Companies have been holding quarterly collaborative meetings. These meetings have covered topics of relevance to the Grid Mod I deployment and have been attended by a diverse set of stakeholders.

While there was time allotted within the meetings for stakeholder questions, Daymark recommends that the Companies be required to better track stakeholder feedback via documented minutes and action items. The Companies do not currently take minutes of the Collaborative meetings<sup>91</sup>, which does not offer assurance that stakeholder feedback is being incorporated into the Companies' Grid Mod I efforts.

Daymark also noted throughout the Collaborative material a lack of discussion around the benefits being achieved by the project. One exception is the DA event analyses, which we discuss in more detail in Appendix 5 – Reliability Metrics. A lack of focus on benefits is endemic in the Companies' Grid Mod I implementation efforts, which we discuss throughout the report. Daymark would expect that reporting on the status of benefit achievement would be a primary topic in Collaborative meetings going forward. Daymark recommends that the Collaborative participants should be involved in discussions pertaining to any adopted recommendations from this report relating to revised projection methods and revised metrics.

### C. AMI/MDMS

**Obligation:** The Stipulation and Opinion & Order identified several obligations for the Companies pertaining to advanced meter deployment and data access<sup>92</sup>:

**Obligation - Paragraph 36:** Per the Stipulation and Opinion & Order, the Companies were obligated to install 700,000 advanced meters along with the necessary supporting communications infrastructure, a MDMS, and associated systems and processes. The Companies were to provide a map of where AMI was being deployed with dates of deployment and an AMI tag on the Customer Information List provided to CRES providers. The AMI deployment was to utilize a scalable Meter Data Management

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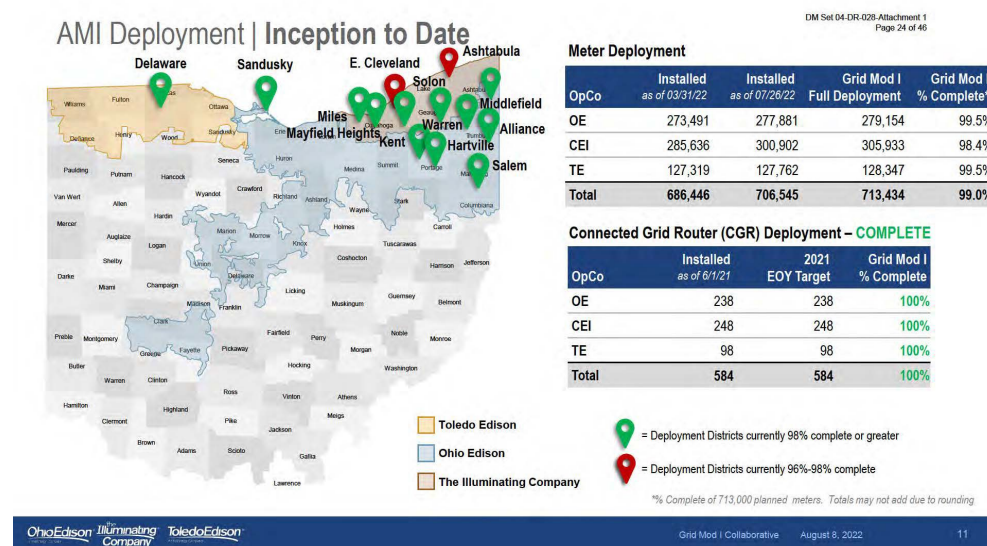
<sup>91</sup> Set 2 DR 4.

<sup>92</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶¶36-39.

System (MDMS) and use the necessary and generally accepted standards to implement a Home Area Network (HAN) in order to allow customers to connect qualified devices.

**Analysis - Paragraph 36:** Daymark reviewed the presentation files from each of the Ohio Grid Mod I Collaborative Meetings held from November 2019 through August 2022 which provided periodic updates on the Companies' AMI deployment status.<sup>93</sup> The August 2022 deck indicated that FirstEnergy had installed 706,545 of the 714,434 meters it planned on installing under Grid Mod I. Associated with FirstEnergy's AMI rollout was the installation of 584 connected grid routers, which was complete as of the August 2022 update, and 600 range extenders which were nearing completion.

The map below in Figure 2 is an example of an AMI deployment map that FirstEnergy provided to Collaborative stakeholders in the collaborative updates.



**Figure 2. Sample AMI deployment map**

Per the Data Access Timeline provided in the Grid Mod I Collaborative meeting held on August 8, 2022, lists of customers with an AMI tag were provided to CRES providers in Q2 of 2020.<sup>94</sup> The Companies have also been providing a performance metric, #14, which indicates the number of customers with certified AMI who have not opted out of Eligible Customer Lists.<sup>95</sup>

<sup>93</sup> Set 4 DR 28 Attachment 1.

<sup>94</sup> Set 4 DR 28 Attachment 1.

<sup>95</sup> Set 2 DR 3 Attachment 1.

The Companies have implemented the Itron Enterprise Edition (IEE) Meter Data Management System (MDMS). Daymark notes that this MDMS platform is scalable and therefore should be able to support future advanced meter deployments.<sup>96</sup>

The Data Access Timeline mentioned above identifies that HAN devices have been integrated from a data access standpoint as of Q4 2020.<sup>97</sup> Performance metric #13 also reports data points for customers having authorized connection of HAN devices<sup>98</sup>; adoption has been limited but demonstrates that customers are able to connect qualified devices per the language of the Order.

**Obligation - Paragraph 37:** Per paragraph 37 of the Opinion & Order, the Companies were to implement data access enhancements for customers and allow CRES providers to access the data through an Application Program Interface (API). The Companies were to also develop a process for CRES providers to provide customer consent to access data for prospective customers.

**Analysis - Paragraph 37:** The Data Access Timeline provided in the Grid Mod I Collaborative deck from August 8, 2022, identified functionalities that have been implemented to provide data access. The timeline indicates that CRES lists, interval data for settlements, most supplier portal and supplier EDI functions (barring Res StS-HIU, Res StS-Rolling 10 day, and 867IU Res Interval Usage), customer portal, and HAN devices have been completed throughout 2020 and 2021.<sup>99</sup> FirstEnergy has held separate collaborative sessions to resolve the remaining data access items.<sup>100</sup>

FirstEnergy in its recent collaborative deck outlined a proposed process developed with the Collaborative to initiate Consent Status across Current & New CRES Residential Customers.<sup>101</sup>

**Obligation - Paragraph 38:** As described in paragraph 38 of the Opinion & Order, within six months of this Opinion & Order, and after consultation with the Collaborative Group, the Companies were to propose a time-varying rate offering for non-shopping customers designed to achieve the energy and capacity savings detailed in the cost-benefit analysis and leveraging enabling devices. The Companies were to work with suppliers to have

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<sup>96</sup> Set 1 DR 1 Attachment 4.

<sup>97</sup> Set 4 DR 28 Attachment 1.

<sup>98</sup> Set 2 DR 3 Attachment 1.

<sup>99</sup> Set 4 DR 28 Attachment 1.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

data ready for a supplier-offered time-of-use product to customers upon the validation, editing, and estimating (VEE) certification of AMI meters. Once there were either (a) at least three suppliers offering products utilizing AMI data or (b) at least three different types of time varying products utilizing AMI data, then the Companies, with Commission approval, were to withdraw their SSO time-of-use rate offering.

**Analysis - Paragraph 38:** The Companies submitted revised tariff pages outlining a time-varying rate offering for non-shopping residential customers with an advanced meter and to expand eligibility for the existing time-varying rate offering to non-shopping non-residential with an advanced meter in Case No. 20-0050-EL-ATA.<sup>102</sup> The Commission approved the Companies' application in January 2021.<sup>103</sup> Pursuant to the Commission's Order, the Companies worked with stakeholders to develop the education and marketing plan for the time-varying rate.<sup>104</sup>

Daymark did not conclude whether the time-varying rate offering met the criterion of being designed to achieve the energy and capacity savings detailed in the cost-benefit analysis.<sup>105 106 107</sup>

Daymark understands from interviews and its review of the Collaborative Group materials that FirstEnergy has met its obligation to support supplier-offered products utilizing AMI data. Daymark understands that suppliers have not begun to offer the number of products utilizing AMI data which would require the Companies to withdraw their SSO time-of-use rate offering under the language of the Order.

**Obligation - Paragraph 39:** Paragraph 39 of the Opinion & Order obligated the Companies to meet with the Collaborative Group within six months of the ruling and to

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<sup>102</sup> See Case No. 20-0050-EL-ATA, Application for Approval of New Tariff Language, 1/17/2020.

<sup>103</sup> See Case No. 20-0050-EL-ATA, Finding & Order, 1/27/2021 at ¶29.

<sup>104</sup> PAC Set 1 DR 21.

<sup>105</sup> Doing so would necessitate a rate design review, which we considered beyond the scope of this audit. However, without such a review, the Companies cannot be said to have proposed a rate which allows for the achievement of the detailed energy and capacity savings.

<sup>106</sup> Daymark relates a critical coordination issue it encountered when examining the time-varying rate component of Grid Mod I: per the Opinion & Order and general case history, CRES time-varying rate offerings were expected to be a major driver of the achievement of the detailed energy and capacity savings. In our understanding, such CRES offerings have not materialized, and even if they had, FirstEnergy would not have full visibility into their performance for reporting purposes.

<sup>107</sup> From the limited data Daymark reviewed on the Companies' SSO time-varying rate offering, the rate does not appear poised to achieve energy and capacity savings as outlined in the cost-benefit analysis; participation has been meager.

submit a plan to Staff detailing the time-varying rate options it reasonably believed would be offered to retail customers by CRES providers.

**Analysis - Paragraph 39:** Daymark, through its review of the collaborative group activities, noted that there have been coordination challenges between the Companies and CRES providers as it pertains to the development of rate options leveraging AMI data. In Daymark's view, the Companies have adhered to the intent of the Order if validated data has been made available to CRES providers so as to allow development of the rate products the market deems beneficial.

## **D. Distribution Automation (DA)**

**Obligation:** Under the approved terms of Grid Mod I, the Companies were to:

- Install DA on at least 200 circuits after collaborating with Staff on circuit selection
- File updated reliability performance standards six months following the Opinion & Order and one year following the completion of the deployment.
- Improve reliability and outage management leveraging DA in conjunction with the ADMS

The usage of DA in conjunction with the ADMS to improve reliability and outage management outcomes is a topic which implicates the cost-benefit analysis and both the operational savings and non-operational benefits discussed therein. Section VI and its related appendices, where they pertain to DA and FLISR, will discuss the extent to which we were able to conclude that these technologies have improved reliability and outage management outcomes.

**Analysis:** The Companies installed DA technologies on 209 circuits<sup>108</sup>, exceeding the 200 identified in the Stipulation and Opinion & Order.

The Companies held a session with Staff in August 2019, during which they covered the circuit selection process. In proposing circuits for distribution automation, the Companies optimized among those with the highest average three-year customer minutes interrupted, highest customer counts, and longest circuit miles.<sup>109</sup>

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<sup>108</sup> Set 1 DR 28 Attachment 1.

<sup>109</sup> PAC Set 1 DR 6 Attachment 1.



The Companies sought to remain contiguous to the existing smart grid footprint in CEI and looked for a contiguous area in TE to maximize circuit ties.<sup>110</sup>

Regarding the Companies' obligation to file revised reliability standards, the Companies filed an application seeking a 30-day extension to incorporate revised reliability evaluation methodologies in March 2020<sup>111</sup> and filed a supplemental application revising reliability standards in April 2020.<sup>112</sup>

Based on our review of the metrics and data, we conclude that the Companies have delivered on their obligation to review circuit selection with Staff and install DA on at least 200 circuits. The Companies also filed their updated reliability performance standards within the allowed timeframe. The Companies should be expected under the approved terms of the project to file further revised standards one year following the completion date. Further discussion of our review of the Companies' success in using DA in conjunction with ADMS to improve reliability and outage management outcomes is discussed in Section VI and its related appendices.

## E. IVVC

**Obligation:** The Companies were to, per the Stipulation and Opinion & Order, install IVVC technologies on at least 202 circuits, after collaborating with Staff to identify circuits to maximize customer benefits.<sup>113</sup> The IVVC technologies, in conjunction with ADMS, were expected to optimize voltage management. The Companies were also to work with Signatory Parties to identify best practices and utilize technologies to achieve energy savings with the objective of achieving four percent energy savings with full deployment of Grid Mod I technologies.

Daymark in the following section evaluates the circuit selection process and the Companies' implementation of the IVVC technology on the requisite number of circuits. Similar to the case for DA above, we defer discussion on whether the IVVC technology has been leveraged to optimize voltage management to Section VI and its related appendices.

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<sup>110</sup> *Id.*

<sup>111</sup> See Case No. 20-0580-EL-ESS, Application, 3/11/2020 at 2.

<sup>112</sup> See Case No. 20-0580-EL-ESS, Supplemental Application, 4/10/2020 at 3.

<sup>113</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶40.



**Analysis:** The Companies installed IVVC technologies on 206 circuits<sup>114</sup>, exceeding the 202 identified in the Stipulation and Opinion & Order.

The Companies held a session with Staff in August 2019, during which they covered the circuit selection process.<sup>115</sup> The circuits selected for IVVC represented approximately 12% of FirstEnergy's Ohio GWh. FirstEnergy considered the results of an internal Conservation Voltage Reduction study in creating its recommended circuit list.

The Companies' circuit selection largely co-optimized DA and IVVC circuit selection for the CEI and TE territories, while in the OE territory several circuits were prioritized based on their IVVC potential only.<sup>116</sup> Daymark inquired about this in its interviews and understands that it was largely a result of geographical differences and legacy circuit design considerations.

Daymark was provided with the Conservation Voltage Reduction Technical Potential Study, which was used as support for the IVVC circuit selection.<sup>117</sup> This study, dated February 2016, evaluated the Companies' distribution circuits' ability to support CVR and to forecast the lowest allowable voltage level on each circuit and the corresponding CVR technical potential for energy savings at that voltage setting. The CVR Technical Potential Study was one of the key supporting documents for the Grid Mod I cost-benefit analysis and is discussed in further detail in Appendix 1 – CBA Assumption Sources: C.

Daymark concludes that the Companies have successfully installed the IVVC technologies on the requisite number of circuits after communicating with Staff on the circuit selection that would maximize customer benefits.

Daymark's conclusions and recommendations regarding the extent to which the IVVC technologies have been leveraged to provide the outcomes indicated in the Opinion & Order can be found in Section VI and supporting appendices.

## **F. ADMS**

**Obligation:** The Companies were to, per the Stipulation and Opinion & Order, install an ADMS which would support features including but not limited to fault isolation and system restoration, integration of DER, use of information in distribution planning, more

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<sup>114</sup> Set 4 DR 28 Attachment 1.

<sup>115</sup> PAC Set 1 DR 6 Attachment 1.

<sup>116</sup> PAC Set 1 DR 6 Attachment 2.

<sup>117</sup> Set 4 DR 19 Attachment 1.

efficient utility operation and planning, and integration with existing and future utility investments, including MDMS and SCADA systems.<sup>118</sup>

**Analysis:** The ADMS installation involved an extensive build and testing timeline which began in Q2 2020 and concluded with an ADMS go-live on August 9, 2022, and an advanced application go-live on August 16, 2022.<sup>119</sup> The advanced applications refer to the VVO system and FLISR tools.

FirstEnergy supplied a list of the capabilities of the Oracle ADMS platform that they planned to utilize, which included: Network Management System, Operations Mobile Application (OMA), Switching and Schematics, Storm Management (ETR Tools), Advanced Feeder Management, Fault Location Analysis, FLISR, Power Flow, VVO, SCADA/LiveEnergy Connect, Training Simulator, and NMS Browser Client (Flex Operations).<sup>120</sup> Daymark was also provided with the Oracle platform's User's Guide, which explained module capabilities in greater detail.<sup>121</sup>

Based on the information provided, Daymark noted the following regarding the list of ADMS capabilities outlined in the Opinion & Order:

- FirstEnergy has demonstrated significant efforts to fully leverage the Fault Location Isolation and Service Restoration tool, the tool being essential to achieving full capability of the DA investment.
- FirstEnergy is not utilizing DERMS capabilities as part of Grid Mod I.<sup>122</sup>
- Daymark observed a lack of emphasis during interviews as well as within the provided Oracle materials on how the capabilities of the platform would enable efficiencies in distribution planning activities.
- Several of the capabilities of the platform should be expected to contribute to increased operational efficiency.
- FirstEnergy has demonstrated plans to further incorporate AMI data into the ADMS platform. These capabilities include Power Outage Notifications (PONs), which is planned for integration by the end of 2023, and the Smartmeter Ping Outage Tool,

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<sup>118</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶42.

<sup>119</sup> Set 4 DR 28 Attachment 1.

<sup>120</sup> PAC Set 4 DR 1.

<sup>121</sup> PAC Set 4 DR 1 Attachment 2.

<sup>122</sup> PAC Set 4 DR 1.

which exists separately but will be integrated with the ADMS at a future unspecified date.<sup>123</sup>

The ADMS platform's go-live occurred during the preparation of this report. As a result, there was little operational experience with the system on which to base conclusions. FirstEnergy has throughout the Grid Mod I implementation engaged in extensive testing activities to support the platform's launch. In Daymark's analysis, the capabilities which were listed in the Opinion & Order have been partially supported by the Companies' ADMS implementation efforts. Gaps exist between the usage of the ADMS platform as envisioned in the Opinion & Order and FirstEnergy's implementation, specifically in the way it will enhance distribution planning activities and the broad objective of operational efficiencies.

The ADMS solution that FirstEnergy implemented contains numerous tools offering differing capabilities. Daymark observed in its interviews that FirstEnergy was strongly focused on launching the FLISR and VVO tools to support the corresponding major subprograms of Grid Mod I. Daymark also notes that the numerous tools to which FirstEnergy now has access do not deliver benefits simply by the launching of the platform; work processes and practices must also be modified to utilize additional sources of data to realize efficiencies. Daymark strongly recommends as part of FirstEnergy's continuing grid modernization efforts that increased attention be given to leveraging the full capabilities of the ADMS.

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<sup>123</sup> Set 3 DR 7.

## V. INDEPENDENT COST-BENEFIT ANALYSIS

### A. Background

The Grid Mod I package as approved was supported by a cost-benefit analysis, which showed a positive net present value over 20 years of operation.<sup>124</sup>

The cost-benefit analysis followed from The Commission’s grid modernization proceeding roadmap, which stated that: “in requests for grid modernization investment, it only makes sense that an EDU include a cost/benefit analysis with the application. This way, the Commission and stakeholders can transparently evaluate whether a grid modernization investment should be made in the first place. Applications for investment should demonstrate that benefits generated by the project will exceed costs on a net present values basis.”<sup>125</sup>

A nonconfidential summary table of the Grid Mod I cost-benefit analysis was provided in Attachment B to the November 2018 Stipulation and is replicated in Table 4:

**Table 4. Non-confidential summary of the Grid Mod I cost-benefit analysis**

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

The benefits the Companies projected in their cost-benefit analysis comprised both operational savings and non-operational benefits. Operational savings are those areas

<sup>124</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶129.

<sup>125</sup> “PowerForward, A Roadmap to Ohio’s Electricity Future,” p. 27, accessed at <https://puco.ohio.gov/utilities/electricity/resources/ohio-grid-modernization>.

where the Companies, by leveraging the Grid Mod I investment, reduce costs or increase revenues. By the design of Rider AMI, these savings are to be netted out of collections, such that ratepayers receive this benefit. By contrast, the non-operational benefit categories comprise outcomes such as avoided energy sales, reliability improvements, and avoided capital investment. The non-operational benefits, by design of Grid Mod I and Rider AMI, do not directly impact FirstEnergy's cost recovery.

The attributed dollar values of operational savings and non-operational benefits varies across the set of technologies. Daymark reviewed the Grid Mod I cost-benefit analysis in detail as part of this review effort.

Daymark notes that the Grid Mod I cost-benefit analysis was the subject of comments from parties to that process, as has been captured in Section IV.C.2.e. (§§97-§122) of the Opinion & Order. Daymark reviewed the conclusions noted in the Opinion & Order as well as the associated case material to understand the context around the development of the Grid Mod I cost-benefit analysis.

## **B. Context and organization of the independent CBA**

We refer the reader back to Section II.D for a discussion of the standard of review pertaining to the independent cost-benefit analysis presented here.

The cost-benefit analysis holds a very central and interconnected role within the scope of this review. We chose to place our independent cost-benefit analysis review ahead of our discussion of benefits, as it forms essential context as to the expectations around benefits to be achieved under Grid Mod I.

The remainder of this section serves as a foundation for findings relating to operational savings and non-operational benefits to be found in Section VI:

- In the following subsection C. Costs, we analyze what was portrayed in the Grid Mod I cost-benefit analysis in terms of the costs of the Grid Mod I program. Against this we evaluated provided data pertaining to the incurred costs of the program and comment on the degree to which the incurred costs reflect a reasonably similar outcome to what was projected.
- In the following subsection D. Timing, we analyze what was portrayed in the Grid Mod I cost-benefit analysis in terms of the timing with which the Grid Mod I technologies were expected to provide associated benefits. Against this we compare available data and comment on the degree to which the

data reflects a reasonably similar outcome to what was projected. Our discussion in this subsection follows from our discussion of the Companies' schedule in deploying the Grid Mod I technologies in Section IV.A.

- In the following subsection E. Benefit assumption sources, we comment on the nature of the numerous sources which informed the Grid Mod I cost-benefit analysis and their associated suitability for use in an audit context.

### C. Costs

The Grid Mod I cost-benefit analysis contains tabs dedicated to detailing the cost assumptions supporting the Grid Mod I investment plan. The costs of the programs are split between capital expenditures and incremental O&M.

Determining whether equipment was procured at lowest possible cost was not within the scope of this review. We note that the case record generally did not carry forward any major stakeholder concerns related to cost.<sup>126</sup>

Daymark reviewed the Companies' methodology regarding incremental O&M expenses in PAC Set 1 DR 18 and 19 and found it to be consistent with our expectations. Daymark also reviewed cost information within PAC Set 1 DR 16 (capital spend) and PAC Set 1 DR 20 (incremental O&M). From this review, Daymark was able to note that the cost data generally aligned with what would be expected at that point in the deployment. The existence of the annual Rider AMI audit process gave Daymark confidence that the Companies have been successful at funding the necessary volume of technologies within the approved cost caps.

Daymark urges continued oversight of incremental O&M related to grid modernization deployments, particularly as stakeholders prepare for the next FirstEnergy Ohio Utilities rate case.

### D. Timing

The Grid Mod I cost-benefit analysis included representations of when costs of technologies would be borne and, conversely, when benefits would be expected to accrue.

Daymark notes lesser concerns with variances in the timing with which costs have accrued in relation to expectations. Daymark has greater concerns regarding the timing

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<sup>126</sup> See Case Nos. 16-481-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶112.

of achieving expected benefits: each year that attainment of a benefit stream is delayed, under time value of money principles, comes at a cost to the party positioned to receive those benefits.<sup>127</sup>

In the discussion of benefits achieved in Section VI, we identify a systemic deficiency that applies to some benefit classes in which benefits have not begun to accrue in any notable volume. Given the asset implementations which FirstEnergy has completed under Grid Mod I to date, there is an opportunity for FirstEnergy to dedicate additional resources<sup>128</sup> to leveraging such technologies to better achieve the represented benefits. Every year that benefits are deferred negatively impacts the cost-benefit analysis and the value accruing to customers.

### **E. Benefit assumption sources**

Daymark scrutinized the numerous supporting analyses which underlay the Grid Mod I cost-benefit projections. We were unable to complete a full assessment of actual program costs and benefits due primarily to the unsuitability of the supporting analyses for use in an audit context; therefore, our conclusions identify improvements that FirstEnergy should adopt to facilitate further audits.

In terms of the audit process itself, while the Grid Mod I cost-benefit analysis does not in our view meet the standard of transparency<sup>129</sup>; however, Daymark recognizes that some of this lack of transparency may have arisen due to the way this consolidated proceeding and phased deployment evolved. In addition, Daymark encountered a situation in

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<sup>127</sup> As an example of the time value of money implications of benefit achievements, Daymark notes that IVVC Benefit #1, Energy Savings, included a projection that the technology would deliver an energy savings benefit of approximately \$1.4 million in the first year of deployment. In our review, we learned that the use of IVVC to achieve energy savings outcomes was constrained by the ADMS launch timelines (See Set 4 DR 22); as such, this year of projected benefit for this category will be subject to approximately three years of delay. Utilizing the Companies' WACC of 7.67% within the cost-benefit analysis as a proxy (Daymark recognizes that cost-benefit analyses of this nature are subject to debate concerning the chosen discount rate), \$1.4 million deferred three years is worth approximately \$1.12 million in present-day dollars, a difference of approximately \$280,000.

<sup>128</sup> Alternatively, depending on the status of program spending in relation to cost caps, a revisiting of the cost-benefit analysis may be necessitated if benefit programs cannot be achieved within established program costs.

<sup>129</sup> For example, the reliance on numerous off-sheet calculation methods.

seeking to analyze the Grid Mod I cost-benefit analysis in which the Companies were not forthcoming in identifying key supporting analyses.<sup>130 131 132</sup>

In terms of the substance of the set of supporting analyses made available to Daymark, they were characterized by a failure to adequately demonstrate and document the reasonableness, appropriateness, sources, and the assumptions associated with employing outputs from certain analyses in the Grid Mod I benefit projections. The supporting analyses represent the anticipated performance of the Grid Mod I technologies based on necessarily imperfect comparisons—for example, deployments of similar technologies in other areas<sup>133</sup> or engineering calculations<sup>134</sup>.

Due to the confidential nature of the Stipulation process, Daymark was unable to determine the extent to which the application of the supporting analyses to the Grid Mod I cost-benefit analysis benefit categories was scrutinized. Regardless, Daymark found documentation of such assumptions during its review to be lacking<sup>135</sup>, which precluded us from drawing audit conclusions as to what the evidence the Companies have offered represented.

Daymark did not consider it within scope to expend time trying to scrutinize such applications to the point of redeveloping assumptions so that we would be able to make firm conclusions as to their reasonableness or appropriateness. However, given the present audit's role in informing the Commission's approach to future phases of grid modernization investment, we identify here some disconnects<sup>136</sup> between the benefit

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<sup>130</sup> Daymark draws attention to PAC Set 3 DR 29, in which the interrogatory seeks assumptions related to the IVVC deployment. Daymark believes that the CVR Study should have been offered as a response to this interrogatory, as it is the source of a key assumption within the top-level cost-benefit analysis to which the Companies' response alludes.

<sup>131</sup> Daymark inquired about the cost-benefit workpapers in its status call involving Staff and FirstEnergy on August 4, 2022. FirstEnergy failed to identify the business case models underlying the assumptions which we identified.

<sup>132</sup> The examples are intended to highlight the difficulty encountered in gaining access to the sources of key assumptions. Daymark was given access to these sources at a point late in the audit timeline; however, we hold that the critical barrier encountered was not one of time allowed for the audit. Rather, the key impediment in Daymark's view was the content and presentation of the assumptions within these sources, as spelled out further in this section and Appendix 4 – Benefit Category Sample Assumption Analysis.

<sup>133</sup> For example, the CEI pilot data was used for several benefit categories, the 2013 SGCC utilized data from grid modernization deployments across the country, and the Companies' AMI business case utilized data from FirstEnergy's Pennsylvania AMI deployment.

<sup>134</sup> For example, the CVR Technical Potential Study.

<sup>135</sup> Daymark would expect to see, for example, documentation as to why the projections undertaken within the 2013 SGCC were applicable to the Companies' territories.

<sup>136</sup> Examples include, but are not limited to, the Companies' usage of the CVR Technical Potential study in forming IVVC energy and capacity savings expectations and the Companies' reliance on 2013 SGCC for



assumptions drawn from the supporting analyses and early indicators<sup>137</sup> of the reality of the Grid Mod I deployment.

Daymark includes an analysis of each of the eight key assumption sources<sup>138</sup> in Appendix 1 – CBA Assumption Sources. In Appendix 4 – Benefit Category Sample Assumption Analysis, we provide as an example a deeper description of one of the benefit categories and the supporting analysis which informed its projection. This appendix is intended to highlight the lack of transparency within the analyses which supported the Grid Mod I cost-benefit analysis and the untenability of establishing assumptions upon which objective audit conclusions could be reached.

To summarize, while the cost and timing aspects of the cost-benefit analysis as discussed in subsections C & D above do not represent critical barriers to our auditing of the benefit outcomes of Grid Mod I, the same does not hold true for the projection approach chosen and its corresponding presentation and documentation of assumptions. We refer to subsection V.A. Background, where we noted context that the Commission provided in its grid modernization proceeding roadmap regarding cost/benefit analyses. The set of assumptions used within the Grid Mod I cost-benefit analysis was not suitable for a transparent evaluation, particularly of the benefit streams with which this audit was so concerned. This shortcoming notwithstanding, in Section VI we describe the state of the Companies' benefit achievement to the level of detail we deemed most practical under the circumstances, and, more importantly, suggest remedial steps such as improved metrics which are aimed at improving ascertainment of benefits going forward.

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both revenue assurance and service outage management outcomes. See Appendix 1 – CBA Assumption Sources for further discussion.

<sup>137</sup> As noted, none of the data which we reviewed reflected any impacts of the ADMS.

<sup>138</sup> Daymark notes that there are additional sources used within the Companies' CBA, e.g. EIA, Handy-Whitman, DOE ICE calculator. However, we view these sources as more suitable for use in the Companies' CBA than the eight sources discussed.

## VI. BENEFITS ANALYSIS

The Grid Mod I cost-benefit analysis included twenty-two benefits categories, split between ten operational savings categories and twelve non-operational benefits categories. The non-operational benefits represent a combined<sup>139</sup> benefit an order of magnitude larger than the operational savings; however, we acknowledge that per the scope of this review the operational savings are of specific importance, due to the mechanics of Rider AMI.

### A. Areas needing improvement

Daymark identified three core areas limiting our ability to audit relating to FirstEnergy's achievement and reporting of benefits under Grid Mod I.<sup>140</sup> Discussion of these areas is intended as an aid for understanding the programmatic design issues which manifest in repeated and similar shortcomings across benefit categories. Daymark suggests that by confronting these programmatic design weaknesses, the Commission and stakeholders might see, across the twenty-two benefit categories, faster and fuller achievement of such benefits and more transparent and useful reporting of progress.

#### **Mismatch | mismatch between projection and evidence**

In an audit context, the burden is on the audited entity to present evidence which aligns with the benefit projection method. FirstEnergy has failed to provide such adequate evidence, instead relying solely on the set of forty-seven Grid Mod I reporting metrics as indicators of achievement of benefits.

The established reporting metrics largely do not suffice as evidence when juxtaposed against the corresponding projection method. For example, a large portion of DA operational savings are predicated within the IVVC and DA Business Case and Financial Model on crew labor savings; none of the current metrics provide indication of crew labor savings over the reporting periods.<sup>141</sup>

For those benefits which most greatly suffer from this deficiency, we suggest a remedy whereby the projection method is reconsidered, simplified, and parties agree upon reasonably collectible and understandable data to be used as evidence of achievement

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<sup>139</sup> Across technologies. The distinct technology categories of Grid Mod I investment involve differing breakdowns of operational savings and non-operational benefits.

<sup>140</sup> For completeness, Daymark notes that the projection of benefit levels themselves were subject to a major deficiency as discussed in Section V.E.

<sup>141</sup> The Companies in Metric #40 report on outage-related truck rolls avoided. This metric does not clearly relate back to any of the DA operational savings projection methods.

of the benefit, an approach that goes beyond simply counting device installations. Our set of proposed metrics as offered in Section III.D seeks to address such mismatches. We also direct the reader to Appendix 2 – Operational Savings and Appendix 3 – Non-operational Benefits to better understand mismatches on a benefit-by-benefit basis.

### **Timing | lack of data available**

For large portions of the operational savings and non-operational benefits, Daymark was unable to obtain appropriate data as a result of the implementation timelines for certain Grid Mod I technologies.

As an example, the ADMS launched in early August 2022, during the writing of this report. As such, there was no data available for Daymark to review that would support the numerous benefits which were dependent on this platform.<sup>142</sup>

Where the lack of data precludes analysis of benefits, Daymark urges caution in verifying the performance of such technologies prior to expanding investment.

### **Investment | lack of resources dedicated**

Daymark notes that the Grid Mod I program as designed and implemented involved distinct technologies spanning several functional areas of three separate operating companies. These technologies, especially the AMI and ADMS, were expected to facilitate discrete and separate use cases, each with significant corresponding benefit streams. Several of these uses require deliberate effort on the part of FirstEnergy to deliver the expected customer benefit; simply installing the technology does not automatically result in benefits being achieved. The evidence which Daymark reviewed indicated that benefit categories meeting this definition tend to have lagged in achieving their projected benefits, which suggests continued organizational effort might be required to reach the full benefit level.<sup>143</sup>

Daymark also observed that several benefit categories have significantly lagged projections in delivering benefits. For example, the Companies represented service

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<sup>142</sup> We note that large portions of the technologies and by extension, the benefit streams, depended on the ADMS. We learned that no measurable IVVC utilization was able to take place prior to the ADMS launch. The entire class of DA investment have largely only been utilized as remotely operable reclosers prior to the launch of the ADMS; the ADMS contains a key advanced application which is to propose switching solutions (advisory mode) and eventually enact switching solutions (fully automatic mode). Finally, there is a sizeable benefit category pertaining to operational savings gained by leveraging certain functionalities of the ADMS platform.

<sup>143</sup> As an example, for ADMS benefits relating to Electric Distribution (ED) training to accrue, the ED organization will need to revise procedures for training.

outage management benefits as mirroring meter deployment (i.e., 100% of benefit upon 100% installation of meters); however, per Set 3 DR 7 the Companies are still engaging in steps to fully utilize this function. Daymark interprets this to mean this benefit stream will at least be subject to a delay in accruing.<sup>144</sup>

In cases where Daymark identified this dynamic, we urge further discussion be held with the Commission regarding the Companies' plan and timeline for dedicating the necessary resources to begin achieving benefits roughly commensurate with the cost-benefit analysis. As part of these discussions, we urge further consideration be given to the incremental costs<sup>145</sup> required to achieve benefits as part of the Grid Mod I plan to ensure that parties are in alignment ahead of additional phases of investment.<sup>146</sup>

Certain systemic shortcomings such as lagging programs may be remediated by developing solutions whereby the utility's return on investment for grid modernization is tied to the adequate achievement and demonstration of benefits as opposed to solely the installation of technologies. Tying the Companies' revenue to the achievement of claimed benefits would provide greater assurance of achievement as envisioned in the Stipulation and Grid Mod I plan generally.

## **B. Summary tables for operational savings and non-operational benefits**

Daymark below itemizes the key benefit categories that make up the ten operational savings and twelve non-operational benefits identified in initial projections.<sup>147</sup> For each benefit category, we identify the sum total nominal benefit over the represented life of the program as presented in the Grid Mod I cost-benefit analysis. We also present any deficiencies we observed regarding each benefit category.<sup>148</sup> The assessments below, like

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<sup>144</sup> Daymark withholds judgment as to the level of the benefit pertaining to service outage management which is expected on account of the opacity of the Companies' application of SGCC results to inform their benefit projection and the lack of data relating to this benefit category.

<sup>145</sup> For example, the manner in which marketing needs for time-varying rates or customer energy management programs were required, or incremental costs relating to revising operational procedures to fully leverage the ADMS capabilities.

<sup>146</sup> Daymark did not consider it part of its review to analyze how the cost expectations for activities to support benefit achievement were formed. Daymark can however hypothesize a situation in which cost caps have been reached before program enablement activities are complete, in which case it may be necessary to revisit the cost-benefit analysis.














<sup>147</sup> Daymark has intentionally omitted the two benefit categories relating to CO<sub>2</sub> emissions reduction as these follow directly from other benefit categories and are not subject to the same deficiencies.

<sup>148</sup> A full circle indicates that we perceived a benefit category to be strongly possessing a deficiency. For example, revenue assurance was marked as strongly deficient regarding the matching of benefit projection to tracked metrics as there are no metrics which purport to indicate achievement of this category. A semicircle indicates that we perceived a benefit category to be weakly possessing a



the deficiency categories themselves, are not proposed as absolute measures, but rather as tools aimed at helping the Commission and stakeholders understand qualitatively the state of benefit achievement and demonstration.

We direct the reader to Appendix 2 – Operational Savings and Appendix 3 – Non-operational Benefits for further discussion of the individual benefit categories.

**Table 5. Operational savings**

OPERATIONAL SAVINGS CATEGORY	NOMINAL SAVINGS <sup>149</sup>	MISMATCH	TIMING	INVESTMENT
AMI – Meter Reading	\$106.7 million			
AMI – Meter Services	\$4.7 million			
AMI – Back Office	\$2.2 million			
AMI – Call Center	\$0.6 million			
AMI – Revenue Assurance	\$14.0 million			
DA – Inspections, Truck Rolls, Outages	\$2.7 million			
DA – Planned Outages	\$0.3 million			
DA – Outage Reduction – Major Storms	\$0.4 million			
DA – Outage Reduction – Minor Storms	\$0.2 million			
ADMS – Dispatch and ED Training	\$43.4 million			

**Legend**

-  Benefit category strongly associated with indicated deficiency
-  Benefit category weakly associated with indicated deficiency

deficiency. For example, meter reading was marked as weakly deficient regarding the matching of benefit projection to tracked metrics as while the Companies report on metrics relating to meter reader FTEs, per Set 3 DR 8 there are additional FTEs as part of this benefit projection which are not captured in the set of metrics.

<sup>149</sup> PAC Set 1 DR 3 Attachment 2 Confidential.

**Table 6. Non-operational benefits**

NON-OPERATIONAL BENEFITS CATEGORY	NOMINAL SAVINGS	MISMATCH	TIMING	INVESTMENT
AMI – Time-Varying Rates (TVR)	\$98.1 million	●	◐	●
AMI – Revenue Assurance	\$49.3 million	●		
AMI – Customer Energy Management	\$55.4 million	●	◐	●
AMI – Service Outage Management	\$109.4 million	●	●	
DA – Reliability Improvements	\$637.7 million	●	◐	
DA – Storm Restoration	\$1,323.7 million	●	◐	
IVVC – Energy Savings	\$214.8 million	◐	●	
IVVC – Capacity Reduction	\$10.3 million	◐	●	
IVVC – Avoided T&D	\$5.6 million	◐	●	
Platform Benefit – Reliability Improvements	\$171.4 million	●	◐	

**Legend**

- Benefit category strongly associated with indicated deficiency
- ◐ Benefit category weakly associated with indicated deficiency

### C. Operational savings conclusions

Daymark was charged with estimating the dollar value and the timing of operational savings as compared to the stipulated amount currently being credited and making a recommendation for an ongoing level of operational savings to be achieved and recognized in rates.<sup>150</sup>

Daymark is unable to make a recommendation for an ongoing level of operational savings to be recognized in rates. Contributing factors include the fundamental lack of benefit-focused metrics (or data) being tracked by the Companies, opaque and indirect savings categories with tenuous connections to measurable budget categories, and timing issues whereby there is inadequate operational history with the technologies to establish conclusively the level of savings that the Companies will achieve.

<sup>150</sup> See Request for Proposal No. RA21-GM-1, 3/9/2022 at 3.

Throughout the report and in the Appendices, we propose several remedies both on a programmatic/incentive level as well as on a benefit-by-benefit level to better support the future verification of operational savings being achieved.

We note that the Opinion & Order contemplates the scenario whereby this review does not result in an adopted recommendation for the amount of operational savings; the Stipulation contains fixed amounts of operational savings to be credited for the fourth, fifth, and sixth years in the event of no adopted recommendation.<sup>151</sup> Daymark recommends that the fixed savings as stipulated be applied going forward and that the program design recommendations listed within the report be adopted to better measure and verify future operational savings.<sup>152</sup>

#### **D. Non-operational benefits conclusions**

As can be observed in Table 6, Daymark identified deficiencies relating to most of the non-operational benefit categories. The assumed non-operational benefits are critical to the Grid Mod I cost-benefit analysis showing an NPV-positive investment.

Daymark urges that the underlying deficiencies be addressed as soon as practical to better inform decision-making relative to grid modernization programs:

- Regarding Grid Mod I, the Companies, as of this report, have spent extensively in both capital investment and incremental O&M to deploy the technologies. It is critical for stakeholders to understand which benefits are accruing and how quickly, an understanding which cannot be reached given the deficiencies noted.
- Regarding future phases of grid modernization, it is critical that the noted deficiencies be addressed such that the most relevant data can be utilized in forming an understanding of how the technologies perform within the Companies' service territories. It is imperative that operational experience gained from the Grid Mod I deployment serve as a basis for future phases of investment.

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<sup>151</sup> See Case Nos. 16-471-EL-UNC et al., Opinion & Order, 7/17/2019 at ¶71.

<sup>152</sup> We feel it important to clarify our logic behind this recommendation, which, given the prevailing lack of evidence surrounding the operational savings categories, is mostly based in policy considerations. The stipulated operational savings amounts for years 4-6 represent significant increases to those amounts credited for years 1-3. From the imperfect data we have reviewed, we expect that the Companies are not positioned to meet operational savings commensurate with these stipulated amounts. We believe it would be improper to in effect reward the Companies by recommending a lower value for savings to be netted out of Rider AMI.

## VII. FINDINGS AND RECOMMENDATIONS

### A. Top-level findings and recommendations

1. The lack of clear documentation of the complete assumptions behind operational savings estimates, combined with the lack of direct reporting as to operational savings being achieved, precluded a direct audit determination of a current and future level of operational savings to be credited to Rider AMI.

**Recommendation:** *Daymark recommends that the fixed savings as indicated in the Stipulation's Attachment D for Years 4-6 be applied going forward and that the recommendations listed within this report be adopted to better measure and verify future operational savings.*

2. Daymark identified three deficiencies that pertained to the achievement and measurement of the twenty-two overall benefit categories. These were: (1) mismatch between projections and evidence, (2) lack of data available, and (3) lack of resources dedicated. Daymark also identified a deficiency pertaining to the derivation of benefit levels from the analyses which supported the Grid Mod I cost-benefit analysis. These deficiencies help to explain commonalities in what we observed across the numerous benefit categories and are important context to our program design suggestions.
3. Standard practice in a review of this nature relies on the audited entity providing both detail about the assumptions underlying benefits projections and data collection related to the realization of assumed benefits, such that the auditor can make an objective assessment of the entity's achievement of the assumed benefits and adherence to cost projections. For most benefit categories, FirstEnergy did not make available the assumptions on the basis of which the expectations of benefits to be achieved were developed or present evidence of performance and/or savings which related back to the original assumptions.
4. FirstEnergy does not directly track operational savings and other benefits related to its investment in Grid Mod I. The Companies have been providing the Grid Mod I Reporting Metrics that were outlined in Attachment C of the November 2018 Stipulation. Daymark found the Grid Mod I Reporting Metrics to contain a limited number of metrics that are directly informative of benefits being achieved. Many metrics relate to implementation status only (such as number of devices installed) or are indirectly informative of the Companies' progress in realizing a benefit.

**Recommendation:** *Daymark suggests refinements to metric definitions and additional metrics on a benefit-by-benefit and technology-by-technology basis to better form a basis for demonstrating savings in operating costs and overall benefits associated with investment.*



5. The Grid Mod I Reporting Metrics lack established target levels that can be used to baseline the monthly reported values, except in cases where targets have been explicitly outlined in the case material.<sup>153</sup> Personnel responsible for preparing metrics are largely unaware of what metric levels might indicate in terms of the Companies' status in achieving the benefit levels and timing proposed in the Stipulation and Cost Benefit Analysis.<sup>154</sup>

**Recommendation: For many of the metrics, setting and tracking target levels along with the actual levels achieved would be appropriate to better identify benefit categories that are lagging behind the Companies' original plan.**

6. There is no established procedure by which those responsible for collecting the metric inputs from the responsible groups use the process as an opportunity to identify and address (if necessary) the level of benefit achievement being observed.

**Recommendation: In categories where the Companies are lagging target levels, the Companies should provide in the report both an explanation of the situation and an outline of organizational steps being taken to improve attainment of the benefit going forward.**

7. Certain benefit streams require continued engagement and organizational focus to achieve, while others accrue passively as a result of the technology being operational. The benefits best being captured at this time tend to fall into the latter category, with room for improvement in the former.

**Recommendation: Closer tracking of the Companies' progress in achieving all benefits, through a more robust Metrics process, will aid in identifying areas where the Companies require additional focus.**

8. Certain benefit streams were represented within the Grid Mod I cost-benefit analysis (CBA) as beginning to accrue throughout the implementation phase (Years 1-3). Some of these benefits have yet to begin accruing in any meaningful quantity.<sup>155</sup>
9. There has been a focus within the Companies' Grid Mod I project management organization (PMO) on implementation of the technologies. Daymark found that the Companies were largely successful in implementing the required number of technologies in the allowed timeframe. Daymark, however, observed a lack of

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<sup>153</sup> In PAC Set 3 DR 31, FirstEnergy provided two examples of target levels: investing in at least 200 DA circuits and achieving 4% energy savings from IVVC when Grid Mod I technologies are fully deployed.

<sup>154</sup> The metric reporting process, as Daymark learned, involves data owners from different business units reporting data to the regulatory team. Daymark found knowledge of details of the cost-benefit analysis and associated expected benefits to be sorely lacking within the teams of these data owners.

<sup>155</sup> The causes for the observed delays in achieving benefits vary, but include actual implementation & commissioning timelines, lack of resources deployed to leverage technology capabilities, and as is the case with the IVVC benefits, failure to represent the dependency on the ADMS launch timeline.

focus within the PMO's meetings on tracking progress related to achieving operational or monetary benefits.

**Recommendation: *We recommend further improvements to the tracking of and incentives around the Companies' achievement of benefits, such that these items become a greater focus within the project management organization.***<sup>156</sup>

10. Portions of the Grid Mod I technologies are undergoing or awaiting full activation at the time of the preparation of this report.<sup>157</sup> As such, there are several technologies and benefit streams which lack collected data to rely on for determining functionality and performance in comparison to planned specifications.

**Recommendation: *Daymark recommends that both the Grid Mod I Reporting Metrics and additional recommended data be collected and analyzed for the performance of these technologies ahead of or as part of the process of reviewing the Companies' Grid Mod II.***

11. The Grid Mod I cost-benefit analysis does not meet the level of transparency which would be expected per the Commission's grid modernization proceeding conclusions, or, more broadly, a level which would allow for audit conclusions to be reached. The Grid Mod I cost-benefit analysis as referenced in the Stipulation was the aggregation of several external analyses, several of which were nontransparent. Daymark found a lack of documentation as to the reasonableness of using certain supporting analyses or specific data from such analyses as inputs within the Grid Mod I cost-benefit analysis.

**Recommendation: *For many benefit categories, Daymark recommends that the Companies be required to revisit benefit projection methods with the charge to improve transparency and, therefore, future auditability. Further, where we identify gaps in documentation pertaining to the usage of supporting analyses within the Grid Mod I CBA, we urge that such revisitation involve stakeholder scrutiny.***

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<sup>156</sup> Daymark notes that the Companies' project management organization sits at a unique place within the organization. The technologies and their associated benefit streams touch several diverse utility functions including, but not limited to, operations, rate design, customer service, etc. Daymark offers that revising the tracking requirements and incentives around the program may result in the Grid Mod I project management organization taking a more active role in identifying need for resources to achieve projected benefits, for example.

<sup>157</sup> The ADMS system was launched in early August 2022 as drafting of this report was underway. Shortly after the ADMS launch, the advanced applications, FLISR and IVVC, were launched. We note that the Companies anticipate an advisory period to be required before the FLISR is utilized for truly automated switching. No Grid Mod I reporting metrics were available reflecting performance of any technologies post-ADMS launch. Further, we note that additional benefit categories lack operational data; for example, per Set 3 DR 7 a portion of the service outage management capability of AMI is awaiting integration into the ADMS.

12. Collectively, the demonstrated operational savings have fallen short of the level included in the Stipulation. We note several implications of this observation: 1) the benefits of the Companies' grid modernization investments have been slower in accruing than anticipated in the cost-benefit analysis, 2) projected benefits require an increased level of organizational effort to achieve, and 3) certain types of benefits resulting from the investment may not be conducive to representation in dollar values.

**Recommendation:** *Daymark recommends revised metric categories that will support Grid Mod I stakeholders in understanding the status of operational savings achievement and allow for actions to be taken in response to either shortfalls or surpluses regarding operational savings levels.*

## **B. Detailed findings and recommendations**

The detailed findings and recommendations below are developed both from the analysis outlined in the body of the report as well as the more detailed analysis provided in the appendices. As the report was developed Daymark opted to move individual benefit category analyses, which contained significant details, to appendices.

### **Advanced Metering Infrastructure (AMI)**

1. Installation and certification of meters is very near full deployment and the Companies have set up the necessary data access and begun to leverage data within the Meter Data Management System (MDMS).
2. The Companies have been able to reduce the number of meter reading routes and the number of meter readers employed.
3. The Companies have begun to leverage the capabilities of the AMI which may provide efficiencies for meter services personnel. Daymark has not been able to identify any budgetary savings associated with meter services functions.
4. The impact of AMI on Call Center operations has been complex. Calls involving AMI meters require new training of call center staff regarding their capabilities and new business process impacts. FirstEnergy staff indicated that they did not expect efficiencies from AMI to result in any downsizing of call center staff.

**Recommendation:** *Call Center report logs should better track the presence of AMI and potential difference in call center volume and time spent on resolutions and the Companies should analyze the associated impact on call resolution time.*

5. The Companies have not collected or presented adequate evidence to determine the meter accuracy benefits that make up the assumed revenue assurance benefit streams.
6. The Companies have presented reporting metrics which indicate performance on the theft detection aspect of revenue assurance; however, the evidence differs significantly from projections, warranting reconsideration of the projection methods.
7. The Companies have filed a Time Varying Rate (TVR) in accordance with the Stipulation which has achieved minimal participation. Realization of the full benefit relating to TVR is dependent on Competitive Retail Electric Service (CRES) suppliers. Daymark has concerns about the coordination and responsibility for achieving this benefit given the nature of the Companies' and CRES suppliers' positions in the market.
8. The Companies are not reporting data related to the performance of the Customer Energy Management (CEM) benefit.
9. The Companies have not adequately demonstrated how they are leveraging the service outage management capabilities of AMI, a benefit which constitutes over \$100 million of the projected benefits within the Companies cost-benefit analysis. The Companies were only able to vaguely describe tools which incorporate these capabilities.

### **Distribution Automation (DA)**

10. The Companies have not been able to provide data which reflects the utilization of the FLISR tool within the Advanced Distribution Management System (ADMS) due to delays in ADMS implementation.
11. The approach to analyzing outage events and reporting Customer Minutes Interrupted (CMI) and Customers Interrupted (CI) presents difficulty in ascertaining customer reliability benefits.

**Recommendation:** *The Companies should report SAIDI / SAIFI performance on circuit-level reliability post-Grid Mod I investment consistent with the way the assumed benefits were derived.*

12. Expanded deployment of reclosers with SCADA has likely saved crews driving time and allowed for operational efficiencies in addressing work orders. However, the

Companies are not expecting to be able to reduce workforce numbers as a result of these efficiencies.

**Recommendation:** *The Companies should be required to demonstrate these efficiencies in their work order tracking process and investigating the extent to which it allows for reduced overtime, spend time on other important efforts, or potentially avoiding future hiring needs.*

### Integrated Volt/Var Control (IVVC)

13. Achieving the full customer benefit from IVVC investment relies on the launch of the ADMS platform and the associated advanced application for volt/var control. Due to the delayed deployment of ADMS there is no evidence from which to draw conclusions about the performance of the IVVC investment.
14. In the Stipulation the Companies represented the IVVC investment as delivering customer benefits early in the implementation period. However, our review has found that attainment of these benefits has rather been contingent on the launch of the ADMS and the corresponding advanced application; this delayed launch occurred in Q3 2022.<sup>158</sup>
15. IVVC Metrics #45 and #46 provide little value in understanding the success of the technology in achieving energy or capacity savings outcomes; there exists no simple relationship between circuit voltage and energy consumption. IVVC Metrics #43 and #44 have no established methodology and thus we cannot evaluate whether the Companies' methodology will adequately indicate energy or capacity savings outcomes.

**Recommendation:** *The Companies should be required to formally outline their measurement approach for #43 and #44. Daymark offers important considerations for the IVVC measurement approach in the proposed metrics improvements in Section III.D.*

### Advanced Data Management System (ADMS)

16. The ADMS solution was launched during the writing of this report. As such, there has been no operational experience to date with the FLISR advanced application, VVO advanced application, or other tools dependent on this platform.

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<sup>158</sup> See OH Grid Mod I Collaborative, dated February 27, 2020, at 22.

**Recommendation: *Daymark recommends that both the Grid Mod I Reporting Metrics and additional data and metrics recommended in this report be collected and analyzed for the performance of these technologies as part of the process of reviewing the Companies' Grid Mod II application.***

17. The Companies' ADMS implementation efforts have been characterized by a strong focus on the FLISR and VVO advanced applications. The ADMS solution the Companies are implementing contains numerous tools beyond the FLISR and VVO advanced applications. The Companies lack information outlining how they intend to leverage the full suite of platform capabilities.

**Recommendation: *The Companies should be required to make a showing of further benefits to be achieved by leveraging the capabilities of the platform as installed and outline a plan including revised procedures where appropriate.***

18. The ADMS operational savings depend on efficiencies in the O&M categories of Dispatch and ED Training. The Companies have not sufficiently demonstrated a plan for leveraging the corresponding ADMS tools within their procedures to achieve such benefits.

**Recommendation: *The Companies should formalize the use of ADMS in Dispatch and Training-related procedures. The Companies should be required to demonstrate the manner in which the efficiencies achieved result in budgetary savings (e.g. reduced overtime, reduced staffing, etc.).***

## APPENDIX 1 – CBA ASSUMPTION SOURCES

In this appendix, we step through each of the major sources of assumptions underlying the cost-benefit analysis workpaper. For each source, we indicate the benefit categories in which it was utilized in the workpaper and then perform an analysis of the nature of the assumptions contained within that source and the extent to which they are appropriately treated by the Companies in their top-level cost-benefit analysis. Our analysis of each source seeks to briefly describe what the source is before evaluating the extent to which pertinent features about the source are appropriately documented for use in an audit context.

Due to a confluence of factors, including the sheer number of benefit categories, the bifurcating nature of the input sources, and the corresponding lack of concise supporting documentation for the Grid Mod I cost-benefit analysis, we are not able to analyze in depth the reasonableness of each assumption. However, we attempt to provide examples of such analyses to highlight the criticality of having reasonably documented assumptions and the way the lack of a record of such assumptions precludes the drawing of objective audit conclusions for most benefit categories.

### A. CEI Pilot

#### Usage

Data from the CEI pilot is utilized within the cost-benefit analysis workpaper in the following ways:

- AMI Benefit #1 – Time-Varying Rates
  - Participation rates
  - Average kWh savings
  - kW capacity savings per participant
- AMI Benefit #3 – Customer Energy Management
  - Average kWh savings
  - kW capacity savings per participant
- DA Benefit #1 – Reliability Improvements
  - SAIFI up to % improvement
  - SAIDI up to % improvement
- DA Benefit #2 – Storm Restoration

- SAIFI up to % improvement
  - SAIDI up to % improvement
- IVVC Benefit #1 – Energy Savings
  - MWh savings from IVVC

## Assumption analysis

Daymark in its interviews and review of case materials observed a significant reliance on the CEI pilot in forming expectations for the performance of the set of grid modernization technologies under Grid Mod I. On its face, we interpret this to be reasonable; the CEI pilot consisted of investments in a substantially similar set of technologies.

Daymark understands the details of the CEI pilot were as follows: In 2010, the Companies were awarded a U.S. Department of Energy Grant.<sup>159</sup> The goal of the grant was to field-deploy smart grid technologies in a pilot area to determine and analyze the capabilities of AMI, DA and IVVC.<sup>160</sup> The project was known as the “Smart Grid Modernization Initiative” (“SGMI”) and was performed in a 40—square-mile area southeast of Cleveland in CEI’s service territory.<sup>161</sup>

The following equipment was deployed in the CEI Pilot Area: 36 DA circuits, 34 IVVC circuits, 8 LTCs, 109 reclosers, 138 capacitors, 3 three-phase regulators, and 20 voltage sensors.<sup>162</sup> FirstEnergy also deployed 34,000 AMI meters in the CEI pilot area and conducted a Consumer Behavior Study from 2012-2014.<sup>163</sup>

Despite the similarity of the technology scopes between SGMI and Grid Mod I, the assumptions underlying the use of the SGMI data in forming expectations as to the performance of the Grid Mod I deployment cannot be ignored within an audit which seeks to evaluate the actual performance of the Grid Mod I program as compared to said expectations. The Grid Mod I deployment is not simply a larger deployment of SGMI; among the plethora of relevant situational factors include broad differences between CEI’s territory and those of the other Companies’, idiosyncrasies relating to the limited set of circuits and customers selected for AMI, DA, and IVVC deployment as

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<sup>159</sup> See Case No. 16-481-EL-UNC, In the Matter of the Grid Modernization Business Plan, 2/29/2016, Exhibit A, at 3.

<sup>160</sup> *Id.*

<sup>161</sup> *Id.*

<sup>162</sup> See Case No. 19-792-EL-GRD, Grid Architecture Status Report, 4/1/2019, Exhibit A, at 1.

<sup>163</sup> *Id.*, at 2.



compared to CEI overall and the Companies' systems overall, differences in the designs of the programs as it pertains to the customer outreach and engagement, differences in the organization of the programs within FirstEnergy, etc.

The list of situational factors that Daymark has identified as being necessary to contextualize the assumptions deriving from the SGMI data should not be construed as saying that the SGMI data is irrelevant in forming expectations for the deployment of Grid Mod I. The industry has long relied upon experience from other jurisdictions to form expectations of deployments at larger scales or in different areas.

However, for an auditor to draw conclusions as to the extent to which actual activities undertaken by the utility reflect expectations, such critical assumptions must be presented. Daymark found the presentation of such context relating to the SGMI program critically lacking.

For example, within the Grid Mod I cost-benefit analysis, the benefit categories that draw input from SGMI as listed above contain the citation "CEI Pilot". Especially as it relates to a long-running and multifaceted program such as SGMI, such inputs do not have universal applicability beyond the context of their source. The ways in which the data leading to the inputs was collected and manipulated is of critical importance to the auditor seeking to utilize the cost-benefit analysis for any purpose. At the very least, Daymark would have expected to see citations to filings or studies within the SGMI which supported the selection of such inputs. In lieu of such citations, Daymark was left to come up to speed on a related, but separate, major investment of FirstEnergy's to simply understand the reasonableness of assumptions informing the Grid Mod I cost-benefit analysis. The burden of such a showing of assumptions, considering the information asymmetries inherent in utility regulation, necessarily falls on the utility.

Though Daymark holds that the burden of presenting critical assumptions which would facilitate an audit of this nature lies with the Companies, we did issue certain data requests which sought to assess the extent to which FirstEnergy was able to present those assumptions.

As an example, we noted above that the SGMI data informed a key input to the expectations for the performance of the TVR benefit in Grid Mod I. In Daymark's experience, one of several key confounding factors and therefore critical assumptions to be outlined in evaluating the performance of time-based rates is the penetration of smart in-home devices within the customer sample. Daymark inquired as to the overlap

of customers participating in the SGMI's time-varying rate offerings and those with smart in-home devices in Set 3 DR 28. Daymark interpreted the Companies' response to this DR as nonresponsive. The Companies did not offer an answer as to whether they could comment on the overlap of customers participating in time-varying rates and those with smart in-home devices. Further, in response to Daymark's request for independent percentages of customers piloting the time-varying rates and those with smart home devices, we were referred to an 80-page report, "FirstEnergy's Smart Grid Investment Grant Consumer Behavior Study"<sup>164</sup> and a 77-page slide deck, "FirstEnergy Consumer Behavior Study Phase 2 Results – Summer of 2014"<sup>165</sup>

FirstEnergy's experience with TVR within the SGMI represents one of numerous critical inputs which formed the Grid Mod I cost-benefit analysis. The example above is intended to highlight the unreasonableness of having an auditor comb through over one hundred pages of prior reports in order to reach an imperfect (keeping in mind that FirstEnergy directly acknowledged in its response to Set 3 DR 28 that they have not tracked the overlap of customers participating in its Rider RCP and those who acquired their own in-home devices) understanding of the extent to which in-home smart devices impacted the time-varying rate results which were used to form the inputs to the Grid Mod I cost-benefit analysis.

Lacking such context, simple reporting of the number of participants in a time-varying rate as the Grid Mod I Reporting Metrics (#16) report can never be construed as being representative of progress in achieving benefits relating to time-varying rates, and therefore an auditor can draw no conclusions.

The example of TVR assumptions taken from the CEI Pilot is only intended by way of example; Daymark notes that data from the CEI Pilot was applied to form projections of several other large benefit categories and similar applicability scrutiny should be applied.

## **B. 2013 SGCC**

### **Usage**

Data from the 2013 SGCC is utilized within the cost-benefit analysis workpaper in the following ways:

- AMI Benefit #1 – Time-Varying Rates

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<sup>164</sup> Set 3 DR 25 Attachment 1.

<sup>165</sup> Set 3 DR 25 Attachment 2.

- Participation rates
- AMI Benefit #2 – Revenue Assurance
  - Improved meter accuracy annual savings per meter
  - Theft detection annual savings per meter
- AMI Benefit #5 – Service Outage Management
- AMI Op Savings Benefit #5 – Revenue Assurance
  - Improved meter accuracy annual savings per meter
  - Theft detection annual savings per meter

### Assumption analysis

The 2013 SGCC, or SmartGrid Consumer Collaborative “Smart Grid Economic and Environmental Benefits” report was provided to Daymark in Set 3 DR 3 Attachment 1. The report was a review of available research quantifying the actual benefits and costs of smart grid technologies to help stakeholders analyze and maximize the value of various capabilities.<sup>166</sup>

Daymark notes that the source report reasonably outlines its assumptions and calculation methodologies. However, given that the 2013 SGCC was a review with a national scope, Daymark would expect a record to exist outlining how conditions and therefore the methodologies applied to calculate benefits differed between the SGCC’s cases and the Companies’ system and situation. Daymark found no such presentation within the case record. On the importance of treating utility idiosyncrasies, Daymark cites from page 6 of the report: “It is important to note that no single utility necessarily has all of these capabilities and each utility’s results could vary significantly from these estimates. The most significant drivers of benefits and opportunities for improvement are described for each capability in this review”.<sup>167</sup>

As an example of the necessity from an audit standpoint for the utility to make a showing of reasonableness of the application, Daymark notes that the 2013 SGCC was the lone source in supporting the expectation for the sum total \$109 million nominal AMI Benefit #5 – Service Outage Management.<sup>168</sup> Regarding this category, the SGCC in Table 2 on Drivers of Smart Grid capability benefits concluded that the most significant

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<sup>166</sup> Set 3 DR 3 Attachment 1.

<sup>167</sup> *Id.*

<sup>168</sup> PAC Set 1 DR 3 Attachment 2 Confidential.

driver of this benefit area was “Utility Operating Characteristics”.<sup>169</sup> Without any consideration given to the applicability of the SGCC’s assumptions to the Companies’ situation, no evidence from the Companies’ deployment could suffice in allowing for an objective audit conclusion as to whether this proposed benefit of the technology deployment has accrued, especially for as abstract a category as service outages.<sup>170</sup>

## C. CVR Study

### Usage

Data from the CVR Study is utilized within the cost-benefit analysis workpaper in the following ways:

- IVVC Benefit #1 – Energy Savings
  - MWh savings from IVVC
- IVVC Benefit #3 – Capacity Reduction
  - kW savings
- IVVC Benefit #4 – Avoided T&D
  - kW savings

### Assumption analysis

The CVR Technical Potential Study was provided to Daymark in Set 4 DR 19. The study was performed in 2014 and considered all the Ohio Operating Company distribution circuits for their potential to support CVR.<sup>171</sup>

In Daymark’s view, the most central assumption relating to the usage of the CVR Technical Potential Study to inform the Grid Mod I cost-benefit analysis is into which category within the CVR Study each of the over 200 circuits that received IVVC technologies under Grid Mod I fell. The CVR Study identified 671 circuits which were deemed high CVR conservation potential and 1,030 circuits which were deemed average CVR conservation potential.<sup>172</sup> In fact, the Grid Mod I cost-benefit analysis presents 2.5% as an energy savings expectation<sup>173</sup> while the CVR Study concludes a 2.3% energy

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<sup>169</sup> Set 3 DR 3 Attachment 1.

<sup>170</sup> Daymark notes that page 53 of the 2013 SGCC acknowledges the fundamental difficulty in ascribing a dollar value to electric service outages. The section within the 2013 SGCC notes that estimates of the economic impact of service outages range from \$30 billion to \$400 billion annually.

<sup>171</sup> Set 4 DR 19 Attachment 1.

<sup>172</sup> *Id.*

<sup>173</sup> PAC Set 1 DR 3 Attachment 2 Confidential.

savings potential for the class of high potential circuits.<sup>174</sup> Further, digging into the methodology contained within the CVR study, Daymark noted that, as it would expect from a fundamental utility engineering standpoint, commercial and industrial customers present a greatly reduced prospect for energy savings from CVR.<sup>175</sup> Daymark also notes that a majority of circuits under the Grid Mod I deployment were chosen to receive both DA and IVVC technologies, and that DA presents greater economic benefits for non-residential customers. Daymark would expect a comprehensive showing of the CVR study results of the set of circuits that were selected to receive IVVC investments, which could provide an auditor confidence that the expectations for energy savings were reasonable. Such a showing was not present within the case material.

Because the CVR Study is not properly contextualized for use in forming expectations for the Grid Mod I IVVC benefits, evidence that the IVVC technology has been implemented on the requisite number of circuits does not allow for the conclusion that the technology is likely to deliver the expected level of energy savings.

## **D. AMI business plan model**

### **Usage**

Data from the AMI business plan model is utilized within the cost-benefit analysis workpaper in the following ways:

- AMI Op Savings Benefit #1 – Meter Reading
  - Full time employees
  - Average annual labor
  - Transportation
  - Equipment/Supplies
  - Annual % of total meter reader savings
- AMI Op Savings Benefit #2 – Meter Services
  - Full time employees
  - Average annual labor
  - Operating costs
  - Equipment/supplies

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<sup>174</sup> Set 4 DR 19 Attachment 1.

<sup>175</sup> See Table 7 within Set 4 DR 16 Attachment 1.

- Annual % of total meter reader savings
- AMI Op Savings Benefit #3 – Back Office
  - Project back office hours reduction
  - Hourly rate
- AMI Op Savings Benefit #4 – Call Center
  - Full time employees
  - Annual salary

### Assumption analysis

Daymark was provided the AMI business plan model in Set 3 DR 13 Attachment 1. The “Model Overview” tab of the model includes a date of 2/22/2016 and contains the lone piece of information: “This tab serves as the introductory page for the model outlining the purpose and structure of the model itself as well as instructions for use.”<sup>176</sup>

Daymark reviewed the AMI business plan model to understand the provenance of the inputs above, which by the calculations performed in the Grid Mod I cost-benefit analysis were essential to forming the expectations of the set of AMI operational savings benefit categories.

Sources within the “Model Inputs” tab, which flow through to separate tabs forming the projections for each of the benefit categories (meter reading, meter services, back office, and contact center), are undocumented, i.e., there are inputs used of which an auditor cannot be assured of their basis. In Daymark’s view, inputs which end up in the Grid Mod I cost-benefit analysis fail to meet the standard of being transparently represented within the AMI business plan model. Given this lack of transparency regarding assumptions, evidence presented to support the relevant benefit categories cannot be contextualized, and the auditor has no comparison on which to draw an objective conclusion as to the achievement of benefits.

## E. IVVC and DA business case and financial model

### Usage

Data from the IVVC and DA business case and financial model is utilized within the cost-benefit analysis workpaper in the following ways:

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<sup>176</sup> Set 3 DR 13 Attachment 1.

- DA Op Savings Benefit #1 – Inspections, Truck Rolls, Outages
  - Annual savings per circuit
- DA Op Savings Benefit #2 – Planned Outages
  - Annual savings per circuit
- DA Op Savings Benefit #3 – Outage Reduction – Major Storms
  - Annual savings per circuit
- DA Op Savings Benefit #4 – Outage Reduction – Minor Storms
  - Annual savings per circuit

### Assumption analysis

Daymark was provided the IVVC and DA business case and financial model in Set 5 DR 1 Attachment 2. Daymark notes based on the cover sheet that the model is a product of Accenture Strategy's, copyright 2015, with the following purpose: "The following document provides a high level [sic] view of the financial impact of agreed upon initiatives as part of the IVVC and DA Business Case Assessment."<sup>177</sup>

Daymark reviewed the IVVC and DA business case and financial model to understand the provenance of the inputs above, which by the calculations performed in the Grid Mod I cost-benefit analysis were essential to forming the expectations of the set of DA operational savings benefit categories.

Daymark notes the presence of undocumented assumptions in calculating the values which are used as inputs to the Grid Mod I cost-benefit analysis. For example, the calculation of operational savings benefit #1, inspections, truck rolls, and outages, is outlined in the first section of the tab "Benefits Calculations – DA"; lines 15 (% reduction in manual inspections due to increased grid visibility) and 32 (% reduction of outage duration from grid automation – blue sky) contain hard-coded values with no justification as to their source.<sup>178</sup> Similarly, inputs used in the "Benefits Calculations – DA" tab which refer to the "FE Operations Data" tab also lack appropriate documentation; for example the input representing "Annual number of manual inspections on distribution grid" (line 14 on the "Benefits Calculations – DA" tab), cites back to line 40 on the "FE Operations Data" tab, which lists a source "FirstEnergy

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<sup>177</sup> Set 5 DR 1 Attachment 2.

<sup>178</sup> *Id.*

estimate”.<sup>179</sup> The calculations as presented in the IVVC and DA business case and financial model do not meet the standard of transparency and lacking adequate treatment of calculation methods and assumptions, the auditor is unable to draw an objective conclusions of the achievement of benefits which rely on these calculations.

## **F. ADMS business case and financial model**

### **Usage**

Data from the ADMS business case and financial model is utilized within the cost-benefit analysis workpaper in the following ways:

- ADMS Op Savings Benefit #1
  - Dispatch annual O&M baseline
  - ED training annual O&M baseline
  - Annual O&M % savings

### **Assumption analysis**

Daymark was provided the ADMS business case and financial model in Set 5 DR 1 Attachment 3. Daymark notes based on the cover sheet that the model is a product of Accenture’s, copyright 2015, with the following purpose: “The following document provides a high level [sic] view of the financial impact of agreed upon initiatives as part of the ADMS Business Case Assessment.”<sup>180</sup>

The critical input which an auditor would require the full context of in order to make any judgment of the ADMS Op Savings as presented in the Grid Mod I cost-benefit analysis is the annual O&M percent savings of 25%. Daymark sought out the calculation supporting the 25% expectation within the ADMS business case and financial model. The value, listed on line 181 of the “Benefits Assumptions” tab, has no documented source. Therefore, the critical input derived from the ADMS business case and financial model does not meet the standard of transparency and lacking adequate treatment of calculation methods or assumptions therein, the auditor is unable to draw an objective conclusion as to the achievement of the ADMS operational savings benefit.

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<sup>179</sup> *Id.*

<sup>180</sup> Set 5 DR 1 Attachment 3.



## G. Avoided Transmission and Distribution Cost Study

### Usage

Data from the Avoided Transmission and Distribution Cost Study is utilized within the cost-benefit analysis workpaper in the following ways:

- IVVC Benefit #4 – Avoided T&D
  - Avoided Trans. \$/kW-Yr
  - Avoided Dist. \$/kW-Yr

### Assumption analysis

Daymark was provided the Avoided Transmission and Distribution Cost Study in Set 6 DR 1 Attachment 1. As stated in the executive summary of the study, “The Study measures the value of reducing the need for T&D capacity expansion as a result of lower than anticipated peak demands due to energy efficiency programs.”<sup>181</sup>

Daymark observed that the Companies used data from Figure 6.1 of the Study within its cost-benefit analysis, taking the midpoint of the low and high range estimates. Daymark found the methodology within the Avoided Transmission and Distribution Cost Study to be well-documented and transparent, supporting its use in drawing an audit conclusion pertaining to IVVC Benefit #4.

## H. Platform Benefits Engineering Study

### Usage

Data from the Platform Benefits Engineering Study is utilized within the cost-benefit analysis workpaper in the following ways:

- Platform Benefit #1 – Reliability Improvements
  - SAIFI up to % improvement
  - SAIDI up to % improvement

### Assumption analysis

Daymark was provided the Platform Benefits Engineering Study in Set 6 DR 2 Attachment 2. Daymark was not referred to the location within the Study where the input to the cost-benefit analysis resides within the Companies response to Set 6 DR 2;

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<sup>181</sup> Set 6 DR 1 Attachment 1.

Daymark also notes that the Platform Benefits Engineering Study contains no cover sheet or other such labeling which provides any level of transparency to a third-party user.

Daymark noted that the inputs to the cost-benefit analysis are in cells AI37 and AJ37 of the “Scenarios” tab. The calculation of these values does not meet the standard of being transparent in terms of the assumptions that went into their calculation. Without a transparent showing as to how the up to % improvement SAIFI and SAIDI expectations were formulated, an auditor can draw no conclusions as to the extent the Companies’ evidence proves that their deployment is consistent with such projections which postulated a \$171 million nominal benefit over the 30-year horizon.

## APPENDIX 2 – OPERATIONAL SAVINGS

In this Appendix, Daymark reviews each of the ten operational savings categories. For each category, we comment on the suitability of evidence provided in the form of the Grid Mod I Reporting Metrics as well as the form of prospective data to be acquired through data requests in evaluating the achievement of the benefit category. Where the available evidence does not comport with the calculation method for the benefit, we suggest revisions that, if adopted, we believe would present a more transparent and auditable set of data.

### A. AMI Benefit #1 – Meter Reading

The Companies report on the number of meter readers employed by month, both internally and externally, in Grid Mod I reporting metrics #10-11. From these metrics, it can be observed that directionally, the meter reader workforce across the Companies have been reduced.

Daymark observed that the FTE reduction shown in metrics #10-11 was less than the projected meter reader reductions presented in the Grid Mod I cost-benefit analysis. Daymark requested discovery of FirstEnergy on this point, to which the Companies noted that the AMI operational savings in the CBA associated with meter reader reduction includes the meter reading workforce (i.e., any employee reduction in meter reading cost centers, meters readers as well as supervisors and managers.)<sup>182</sup>

Based on this information, Grid Mod I reporting metrics #10-11 do not fully represent the meter reader operational savings, and, therefore, do not allow for a complete audit determination of the level of savings. Instead, FirstEnergy must identify those budgetary line items which are contemplated to be impacted by the benefit category as defined by the Companies cost-benefit analysis and supporting AMI business case model as discussed above. In the spirit of simplicity and transparency, however, Daymark for this benefit area recommends expanding the metrics reporting to capture the staffing levels of additional meter reading related roles which are most impactful to the operational savings calculation. Concurrently, Daymark recommends that the operational savings projection be revised to remove the nonlabor cost savings unless FirstEnergy commits to presenting evidence which demonstrate these savings.

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<sup>182</sup> Set 3 DR 8.

Regarding the expectation of the level of cost savings relating to meter reading going forward, Daymark is unable to make an auditing determination. The AMI business case on which this operational savings is predicated is not transparent in its assumptions as to the drivers of the labor and nonlabor cost savings; therefore, Daymark can draw no conclusions as to the level of future savings to be achieved.

### **B. AMI Benefit #2 – Meter Services**

Per the Grid Mod I cost-benefit analysis, the meter services operational saving benefit category represented a reduction in labor costs with some associated nonlabor costs. We note that per the time phasing presented, only a fraction of these benefits was expected at this point in the deployment; in Year 3, 38% were projected to be achieved. We also note that the total number of full-time employees reduced in this area was projected to be two; therefore, per the presented time phasing, it does not appear that the Companies would have expected a downsizing in the labor for this category.

Daymark notes that there are no Grid Mod I Reporting Metrics which directly indicate outcomes related to the Companies' meter services function staffing. Daymark requested meter services department budget and variance reports from FirstEnergy in Set 3 DR 12. The reports do not reveal a clear trend that meter services cost savings have been achieved.

Daymark proposes that the Companies either: (1) report on meter services related FTEs and correspondingly revise the operational savings benefit to reflect only labor-related costs or (2) transparently outline the assumption sources for meter reader related savings and present budgetary reports clearly identifying where Grid Mod I activities have driven savings.

### **C. AMI Benefit #3 – Back Office**

The Grid Mod I cost-benefit analysis projects back-office savings driven by labor reductions beginning in Year 4 of the deployment. Therefore, there was no expectation that there would be reviewable benefit achievements in this category at the time of this review.

The Companies' presentation of the assumptions leading to the calculation of this benefit category do not meet the standard of transparency; therefore, the audit cannot sufficiently evaluate the status of the key drivers forming this benefit. Lacking a review of key drivers, nothing can be said of the Companies' position to achieve this benefit in future years.

Daymark recommends that the Companies report on back-office staffing levels to assess this benefit, as this benefit appears to capture exclusively labor-related savings. To the extent the Commission or stakeholders wish to evaluate drivers and therefore gain a more nuanced understanding of how the AMI deployment has impacted back-office functions, Daymark recommends that the business case supporting this benefit be revisited with the goal of increasing transparency.

#### **D. AMI Benefit #4 – Call Center**

The Grid Mod I cost-benefit analysis projects call center savings driven by labor reductions beginning in Year 4 of the deployment. Therefore, there was no expectation that there would be reviewable benefit achievements in this category.

The Companies' presentation of the assumptions leading to the calculation of this benefit category do not meet the standard of transparency; therefore, the audit cannot sufficiently evaluate the status of the key drivers forming this benefit. Lacking a review of key drivers, nothing can be said of the Companies' position to achieve this benefit in future years.

Daymark from its interviews was able to gather that the impact of advanced meter deployments on call center operations was two-sided; that is, while interviewees offered examples of some call types that could be resolved more quickly utilizing AMI capabilities, there are also additional call types and training for operators needed which have the effects of increasing burden on the call center. Daymark notes that this dynamic was represented within the AMI business case. However, Daymark learned through a data request that FirstEnergy does not track within order types which calls are from customers with advanced meters versus those with traditional meters.<sup>183</sup>

Therefore, even if the benefit calculation met the standard of transparency, the data would be unavailable to comment on the benefit achievement.

Daymark recommends that the Companies report on call center staffing levels to assess this benefit, as this benefit appears to capture exclusively labor-related savings. To the extent the Commission or stakeholders wish to evaluate drivers and therefore gain a more nuanced understanding of how the AMI deployment has impacted call center functions, Daymark recommends that the business case supporting this benefit be revisited with the goal of increasing transparency. As part of such a review, it would be necessary to ensure that the Companies track the requisite data relating to such drivers;

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<sup>183</sup> Set 3 DR 23.

as noted above, the Companies do not gather data allowing them to perform analyses of call time averages between AMI and non-AMI customers within an order type.

### **E. AMI Benefit #5 – Revenue Assurance**

The revenue assurance operational savings benefit comprises two advanced meter benefits, improved meter accuracy and theft detection. The core inputs for both areas lie within the 2013 SGCC. For the purposes of the calculation of the operational savings, the overall benefit was scaled by the percentage of base distribution compared to total revenue.

Daymark notes that per the SGCC, the meter accuracy benefit relies on the assumption that traditional meters are more likely to be slow than Smart Meters.<sup>184</sup> Daymark inquired as to any analyses the Companies performed which would provide indication of the accuracy of its traditional meters in Set 4 DR 32; Daymark interprets the correspondence received to be nonresponsive. In absence of evidence of traditional meter versus advanced meter accuracy within the Companies' territories, simple installation of the number of meters cannot be taken as proof that the meter accuracy benefit is being achieved.

The Companies in Grid Mod I reporting metrics #27-28 report on the number of AMI meter tampering cases and the investigation outcomes. The total dollar value of the investigation outcomes as of the end of June 2022 was \$3,425.48.<sup>185</sup> By the Grid Mod I cost-benefit analysis, the theft detection benefit was projected to be on the order of  $\$2.45 * 700,000 = \$1,715,000$  annually with all meters installed. Based on what has been reported in the metrics compared to the projections, we conclude that this benefit has not accrued in a fashion consistent with projections.

In its audit process pertaining to this benefit category, Daymark noted what in its view is a nontrivial assumption which merits review. The Companies chose to scale the SGCC-calculated values for these categories, which was intended to adjust the value used in the SGCC to then-current cost per kWh for the Companies' customers.<sup>186</sup> However, the referenced calculation within the SGCC utilized a price for electricity for industrial users as a proxy for variable electricity cost.<sup>187</sup> The adjustment of this price represents a change in calculation approach; that is, even if the SGCC calculation for revenue

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<sup>184</sup> Set 3 DR 3 Attachment 1 at 27.

<sup>185</sup> Set 4 DR 25 Attachment 1.

<sup>186</sup> Set 3 DR 3.

<sup>187</sup> Set 3 DR 3 Attachment 1.

assurance and theft detection were deemed appropriate, this adjustment would render them invalid.

Daymark recommends that the Companies for the revenue assurance operational savings categories revisit the SGCC methodologies and present evidence representing actual data in these categories. For example, where the SGCC utilizes a certain traditional meter accuracy in its benefit calculation, the Companies' evidence should include a representation of the traditional meter accuracy in their territories. Such a comparison would suffice in allowing for an audit determination as to whether the deployment aligns with projections.

### **F. DA Benefit #1 – Inspections, Truck Rolls, Outages**

DA benefit #1 within the Grid Mod I cost-benefit analysis captures the impacts of several discrete benefits of the DA technology. The formulation of the benefit expectation in the Grid Mod I cost-benefit derives from the IVVC and DA Business Case and Financial Model.

The Companies in the Grid Mod I Reporting metrics provide some data which is loosely indicative of their performance in achieving this benefit. We note that in metrics #39 and #40 that they report on truck rolls related to an outage and outage-related truck rolls avoided, respectively. The Companies also in metrics #34-36 report on metrics which give an indication of the number of times DA operated for each reporting month.

Daymark perceives a critical disconnect between the general methodology used within the IVVC and DA Business Case and Financial Model to formulate the expected benefits falling under this category and what the Companies have been reporting through the metrics or have been able to provide through interrogatory responses. We note that a significant portion of the savings as projected relate to a labor benefit in outage reduction from grid automation. We sought to better understand what data the Companies collect could assist in understanding the impacts this technology has had in restoration times; for example, in Set 4 DR 6 we were told that the Companies do not account for the time that it takes for a DSO to react to an outage situation and in Set 4 DR 8 we were told that the Companies do not track purposes for truck rolls beyond "outage-related". Without this type of data, no auditor can make comparisons between the labor intensity of performing restorative work on the circuits on which DA has been implemented as compared to the utilities' other circuits, as would be required under the calculation method proffered in the IVVC and DA Business Case and Financial Model. Further, we continue to note the difficulty of making any determination as to the

impacts of the FLISR module given the absence of operational experience with the technology.

Daymark for the DA-related operational benefits recommends that the Companies be required to make a revised, transparent showing of the projections, with attention given to the data that can be collected and utilized by stakeholders to understand progress. Daymark draws attention to that fact that across the DA operational savings projections, labor savings drive a significant portion of the benefits. If this is the case, Daymark recommends an appropriate type of data to review for audit purposes would be budgetary; that is, the DA technology is only successfully delivering operational savings if it can be demonstrated within operational budgets.

### **G. DA Benefit #2 – Planned Outages**

The formulation of the benefit expectation for DA – Planned Outages in the Grid Mod I cost-benefit derives from the IVVC and DA Business Case and Financial Model. As we note above, this workpaper contains undocumented assumptions to the point where such a benefit is not auditable.

The Companies report no metrics which indicate the extent to which DA has been leveraged to provide efficiencies in setting up planned outages. Daymark was able to gather limited information about the Companies' planned outages procedures and how they intend to leverage DA to provide efficiencies through its interviews and interrogatory Set 4 DR 15.

The savings captured in this benefit category pale in comparison to the slightest of rounding errors in other operational savings and benefit categories; as such, Daymark recommends that this benefit be considered for consolidation with other DA operational savings. The Companies institute approximately six planned outage events per year<sup>188</sup>; considering DA technology has been deployed on approximately 7% of circuits<sup>189</sup>, one would expect less than one planned outage per year to leverage DA technology, all else held equal.

If the Companies wish to retain this benefit category, we recommend that they provide reporting on planned outage activities on the DA circuits and provide a comparison to equivalent activities on non-DA circuits to seek to prove the benefit as shown in the IVVC and DA Business Case and Financial Model. Alternatively, Daymark notes that like several

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<sup>188</sup> Set 4 DR 15.

<sup>189</sup> PAC Set 1 DR 31 Attachment 1.



other DA benefit categories, the primary driver in the benefit calculation is saved labor, and thus, the most appropriate material in an audit context would be a showing pertaining to operational budget savings.

### **H. DA Benefit #3 – Outage Reduction – Major Storms**

The formulation of the benefit expectation for DA – Outage Reduction – Major Storms in the Grid Mod I cost-benefit derives from the IVVC and DA Business Case and Financial Model. As we note above, this workpaper contains undocumented assumptions to the point where such a benefit is not auditable.

Like other DA operational benefit categories, DA – Outage Reduction – Major Storms is formulated on an assumption that the DA technology results in increased efficiencies in restoring service, constituting a savings. None of the types of data the Companies report in the metrics or can be reasonably acquired and analyzed within interrogatories suffice as evidence of a benefit calculation such as this. Sufficient evidence for a benefit showing such as this necessarily involves the treatment of restoration outcomes on the set of DA circuits as compared to the non-DA circuits, such that a user of the data could determine to what extent the efficiency assumptions are being borne out. The Companies' DA event analyses are not sufficient in allowing for such a comparison; these analyses do not draw comparisons to equivalent events on non-DA circuits to reach any understanding of the level of efficiency being achieved through the DA deployment.

Daymark notes that the primary driver for this benefit calculation is saved labor, and thus, the most appropriate material in an audit context would be a showing pertaining to operational budget savings.

### **I. DA Benefit #4 – Outage Reduction – Minor Storms**

Daymark notes no fundamental difference between DA - Outage Reduction – Minor Storms and DA – Outage Reduction – Major Storms beyond the classification of the events which form these categories. Daymark also draws attention to the size of this benefit category and recommends it be consolidated. Our conclusions on DA – Outage Reduction – Major Storms all apply to this benefit category.

### **J. ADMS Benefit #1**

The ADMS operational savings within the Grid Mod I cost-benefit analysis related to efficiencies being achieved in two areas, dispatch and Electric Delivery (ED) training. As noted in Appendix 1 – CBA Assumption Sources, the ADMS Business Case and Financial

Model which supported the efficiency projection is not transparent, and therefore not auditable.

Given that the launch of the ADMS occurred during the writing of this report, we note that the Companies could not have provided any evidence which would show achievement of a given level of benefit. Further, given that the assumptions within the supporting sources were not well-founded, we are unable to comment on key drivers which would provide indication of a future level of savings to be achieved. We also note that, based on our interview discussions, the ADMS rollout has understandably involved a degree of prioritizing functions within the platform, with the DA- and IVVC-related functionalities being a focus. We inquired as to the steps being taken to achieve dispatch and ED training related benefits and, while FirstEnergy was able to address at some level the capabilities of the system in this area, they were unable to present revised documentation or other evidence which could be treated as indication that they were likely to realize this benefit following the launch.

Daymark notes that none of the ongoing Grid Mod I performance metrics provide indication of the performance of the ADMS in achieving the projected operational benefits. Given that the majority of the benefit projections rely on assumed budgetary savings, Daymark suggests that future evidence provided pertaining to the ADMS operational benefit should involve budgetary savings related to dispatch and ED training categories in the O&M budget.

## APPENDIX 3 – NON-OPERATIONAL BENEFITS

In this Appendix, for each benefit, Daymark offers a brief description of why we've identified the level of deficiency in achieving and demonstrating the benefit. Further, for certain categories we offer some suggestions as to benefit-by-benefit scrutiny that might be applied in discussions around Grid Mod I and future phases of grid modernization.

### A. AMI Benefit #1 – Time-Varying Rates (TVR)

- **Mismatch – Strong:** The time-varying rate savings are necessarily related to outcomes in achieving energy and capacity reductions. Reporting metrics #15 and #16 only report the number of TOU rate offerings and participation and do not suffice as proof that such programs are delivering the purported energy or capacity outcomes.
- **Timing – Partial:** According to the metrics sheet (Set 4 DR 25 Attachment 1), the Companies have had a residential TOU offering since approximately February 2022. We identify this as a partial deficiency since there, in theory, should exist some data as to performance of the program thus far, but customer participation has been extremely limited as of the writing of this report.
- **Investment – Strong:** Time of use rate offerings in Daymark's experience require deliberate program design including marketing plans to be successful. Daymark observes that based on reporting metric #16, participation in the Companies' TVR has been extremely limited to date, which suggests a lack of resources being expended on this program. Daymark in interviews with the Companies and through the Collaborative session it attended notes a concerning dynamic with this particular benefit category; the Companies seem to be relying on CRES providers to achieve TVR benefits substantively consistent with the cost-benefit analysis, which in Daymark's view is a fundamental program design deficiency to be remedied.

### B. AMI Benefit #2 – Revenue Assurance

Daymark refers to the discussion in Appendix 2 – Operational Savings: E for the corresponding operational savings.

### C. AMI Benefit #3 – Customer Energy Management

- **Mismatch – Strong:** The Companies in the reporting metrics present several data categories relating to customer energy management concepts (#12, #13, #17). However, like TVR above, none of these metrics address the critical need to reflect the energy and capacity savings being delivered by the program.

- **Timing – Partial:** Similar to TVR above, the Companies have the technological groundwork completed to begin delivering on this benefit,<sup>190</sup> but utilization has been extremely low to the point where any data the Companies present would not be on the necessary scale to prove benefits.
- **Investment – Strong:** Similar to TVR above, CEM is a program which in Daymark's experience requires active and deliberate design and marketing. The metrics which loosely relate to CEM suggest that the program has been slow to take off, which presents an opportunity for further application of resources to achieve increased customer benefits.

#### D. AMI Benefit #4 – Carbon Emission Reduction

Daymark notes no deficiencies with Carbon Emission Reduction beyond those present in the related benefit calculations (TVR and CEM).

#### E. AMI Benefit #5 – Service Outage Management

- **Mismatch – Strong:** No reported metrics in Daymark's view seek to track outcomes relating to this benefit category. There is no clear connection between the projection methodology and anything trackable or reportable. Daymark urges that such a connection be established, especially given the magnitude of this benefit category.
- **Timing – Strong:** Daymark understands from Set 3 DR 7 that the Companies are currently integrating the AMI service outage management capabilities into its systems, with one capability not planned for integration with the ADMS until late 2023. Based on this response, Daymark has concerns as to whether sufficient data can be available to demonstrate the reasonableness of this \$109.4 million nominal category ahead of future phases of grid modernization deployment.

#### F. DA Benefit #1 – Reliability Improvements

- **Mismatch – Strong:** Daymark highlights significant concerns with the metrics being tracked regarding DA as compared to how the benefit was formulated in projections. The DA benefits were calculated based on expected SAIFI and SAIDI improvements, which, while they are subject to frequent debate relating to randomness, storm classification, etc., are well-established utility reliability concepts. The Companies' theoretical customer minutes saved, and theoretical customer interruptions saved (metrics #41 and #42 respectively) represent an incongruous measure. Appendix 5 – Reliability Metrics contains further discussion of the deficiencies of these metrics in evaluating reliability outcomes.

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<sup>190</sup> Per the reporting metrics, residential customers have accessed usage data as early as April 2021.

- **Timing – Partial:** Daymark notes that none of the data presented by the Companies reflects the usage of the FLISR tool within the ADMS. Further, we highlight that there is a planned, extensive period during which the FLISR will be used in advisory mode while operators become comfortable with the algorithm’s solutions; Daymark was not made aware of any firm timeline as to when the FLISR would be utilized in fully automatic mode. Without full utilization of the technology as outlined in Grid Mod I, stakeholders will be unable to assess whether the DA investment is delivering the promised level of benefit.

## G. DA Benefit #2 – Storm Restoration

The storm restoration piece of DA is congruous to DA Benefit #1 – Reliability Improvements and thus is subject to the same deficiencies.

## H. IVVC Benefit #1 – Energy Savings

- **Mismatch – Partial:** Daymark offers that metrics #45 and #46 (average system voltage and average circuit voltage, respectively) do not provide useful information as to the performance of the IVVC in delivering energy savings.<sup>191</sup> Metric #44, MWh saved due to IVVC, purports to present appropriate data. However, the Companies have not explained how this data will be gathered and presented.<sup>192</sup>
- **Timing – Strong:** Per the Companies’ response to Set 4 DR 22, the ADMS launch was a prerequisite to measuring or performing any energy-saving actions utilizing the IVVC set of investments. Given that the ADMS launch occurred in August 2022, no data is currently available for usage in understanding the performance of this benefit stream.

## I. IVVC Benefit #2 – CO<sub>2</sub> Reduction

Daymark notes no deficiencies with the CO<sub>2</sub> Reduction Benefit beyond those present in the IVVC Energy Savings category.

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<sup>191</sup> There does not exist a simple relationship between system voltage and energy consumption on feeders; such a relationship is driven by the nature of the loads connected.

<sup>192</sup> Measuring energy savings as the result of conservation voltage reduction is not a trivial exercise. Energy consumption on feeders is inextricably tied to variables such as weather, season, and time of day, and therefore measurement necessarily requires statistical analyses, e.g., randomized control experiments. Daymark stresses that such measurement absolutely must reflect circuit-level current measurements.

### **J. IVVC Benefit #3 – Capacity Reduction**

The IVVC Capacity Reduction benefit category is congruous to the IVVC Energy Savings benefit category and as such, the same concerns and recommendations apply.

### **K. IVVC Benefit #4 – Avoided T&D**

The IVVC Avoided T&D benefit hinges strongly on the capacity savings expectations which are subject to the deficiencies listed above. Daymark notes no particular concerns in the application of the 2016 Avoided T&D study to estimate value of avoided T&D.

### **L. Platform Benefit #1 – Reliability Improvements**

The platform investment benefit, as a projection driven by reliability performance improvements, is subject to the same fundamental deficiencies as DA. As in that section, Daymark directs the user to Appendix 5 – Reliability Metrics further describing the incongruity of CMI/CI metrics and SAIDI/SAIFI outcomes.

Regarding the platform benefit, Daymark urges continued stakeholder review of the “stacking” of reliability improvements from the platform work in comparison with DA, especially as the Companies prepare to file updated reliability performance standards per the Opinion & Order.

## APPENDIX 4 – BENEFIT CATEGORY SAMPLE ASSUMPTION ANALYSIS

### A. Sample benefit unpacking

Daymark walks through and comments on one operational benefit category to demonstrate what our audit approach would be to evaluate the achievement of one of the Grid Mod I benefit categories and the difficulty of doing so given the Companies' presentation of their analyses. This example is offered to highlight the importance of having assumptions transparently represented within cost-benefit analyses, which is a prerequisite for objective audit conclusions.

Daymark chose to discuss the first of the distribution automation-related operational benefits for the purposes of this example. Daymark noted upon early review of the cost-benefit analysis that the set of DA operational benefits relied upon \$/circuit annual savings assumptions for which the further underlying assumptions existed in other workpapers. A screenshot of the benefit can be found below in Figure 3. Line (10) contains the key savings per circuit value for which underlying assumptions exist in sources beyond the summary cost-benefit analysis.

Estimated Operational Savings - DA

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Benefit #1 - Inspections, Truck Rolls, Outages		42.5%	42.5%	15.0%	
(1)	Assumptions	CEI	OE	TE	TOTAL
(2)	Source / Calculation				
(3)	Number of Circuits				
(4)	Year 1	28	28	10	67
(5)	Year 2	28	28	10	67
(6)	Year 3	28	28	10	67
(7)	Total Deployment	85	85	30	200
(8)					
(9)	Annual Savings				
(10)	per Circuit	\$ (396)	\$ (741)	\$ (731)	Case No. 16-481-EL-UNC
(11)					
(12)	Annual Growth	2%	2%	2%	Assumption
(13)					
(14)					
(15)					
(16)					
(17)					
(18)					
(19)					

**Figure 3. DA operational savings CBA screenshot**

Daymark was provided with the workpaper supporting the DA benefits calculations in Set 5 DR 1 Attachment 2. The portion of the Benefits Calculations – DA tab which pertains to the operational savings category in question is shown below in Figure 4 below.

## Benefits Calculations - DA

Benefits Count	Description and Calculation	Type	Unit	TE	CEI	OE	Total
	Annual number of manual inspections on distribution grid		#	2,115	2,519	11,488	16,122
	x % Reduction in manual inspections due to increased grid visibility		%	10%	10%	10%	10%
	x Average cost per manual inspection (including Vehicle, Time and Materials)		\$/#	17.8	32.3	14.6	17.8
1	= Total benefit from eliminated manual inspections	O&M	\$	3,760	8,140	16,772	28,673
	Average Number of DA Outages		Outages	N/A	N/A	N/A	900
	x Number of Miles / Outage		Miles	N/A	N/A	N/A	8
	x Cost per Mile		\$/Mile	N/A	N/A	N/A	\$ 2.00
	= Mileage Cost		\$/Year	2,121.56	5,132.44	7,146.00	14,400
	Average Number of DA Outages		Outages	N/A	N/A	N/A	900
	x Average Truck Travel Time		Miles	N/A	N/A	N/A	0.50
	x Cost of Labor per Hour		\$/Mile	N/A	N/A	N/A	\$ 75.00
	= Labor Savings		\$/Year	4,972.40	12,029.15	16,748.45	33,750
2	= Total Truck Roll Savings	O&M	\$/Year	7,094	17,162	23,894.45	48,150
	Number of outages (Blue Sky)		#	2,760	5,792	11,389	19,941
	x Average outage duration (CAIDI) (Blue Sky)		Minutes	101.9	99.9	103.0	102.0
	x % Reduction of outage duration from grid automation (Blue Sky)		%	20%	20%	20%	20%
	= Total reduction of outage time from grid automation (Blue Sky)		Minutes	56,228	115,779	234,718	406,725
	+ Minutes per hour		Mins/Hr	60	60	60	60
	x Average number of employees involved in outage restoration (Blue Sky)		#	3	3	3	3
	x Average hourly cost per employee		\$/Hr	90.8	75.2	71.5	75.2
3	= Total labor benefit in outage reduction from grid automation (Blue Sky)	O&M	\$	255,359	435,040	838,646	1,529,046
<b>Total DA Benefits - Require Option Circuit Proration</b>				<b>\$ 266,214</b>	<b>460,342</b>	<b>879,313</b>	<b>1,605,868</b>
	x Target Circuit Scope Pro-Rate		%	19.1%	19.1%	19.1%	19.1%
	<b>Prorated Total DA Benefits</b>	O&M	\$	<b>50,967.28</b>	<b>88,133.50</b>	<b>168,346.58</b>	<b>307,447.37</b>

Figure 4. Benefits calculation – DA

Daymark below walks through the three subcategories making up this DA operational savings expectation. We intend to expressly<sup>193</sup> and loosely describe some of our observations upon reviewing such a spreadsheet to highlight the unsuitability of using an analysis of this nature<sup>194</sup> in an audit context.

## Benefit from eliminated manual inspections

The input to the first line item, annual number of manual inspections on distribution grid, is found in a separate tab, “FE Operations Data”, for which the source is cited “FirstEnergy estimate”. This is the limit of the support contained within the workpaper – context around such an estimate is not provided for auditors or the benefit of future utilizers within FirstEnergy.

The second line item, percent reduction in manual inspections due to increased grid visibility, has no reference; it is a hard-coded value, which requires more data requests to resolve or may not have an underlying document.

<sup>193</sup> Daymark attempted to streamline this sample benefit example considerably for comprehensibility within the report. Our doing so should not be construed as indicating that an auditor’s utilization of this piece of supporting analysis would be straightforward. For example, a large volume of data requests would be required to understand the numerous undocumented assumptions, unclear transformations of data, etc.

<sup>194</sup> The nature of the DA business case supporting analysis itself notwithstanding, Daymark reemphasizes the unusualness and audit challenges brought about by having critical assumptions for a single benefit category spread across multiple documents. Many benefit categories were subject to a related situation.



The third line item, average cost per manual inspection, is found in the tab “FE Operations Data”, for which the source is cited “FirstEnergy estimate”. Like above, this is the limit of the support given for this figure within the work paper.

### **Truck roll savings**

Each of the inputs forming the \$/year result are indicated as “FirstEnergy estimate”. A set of data requests would have to be executed to understand how FirstEnergy arrived at these numbers since the evidence is not readily included in that spreadsheet for the ease of auditor or future FirstEnergy use.

Approximately 70% (\$33,750/\$48,150) of the savings calculated relate to labor associated with truck travel time. Alleviating the burden on O&M staff can only result in observable and calculable savings by: (1) allowing for a reduction in resource (staffing) needs or (2) allowing for a reduction in overtime utilized by the departments.

The Companies’ proposed explanation is that the impacts of DA technology implementation on field crews’ activities are that DA implementation leads to quicker restorations, turns previously sustained outages into momentary outages, creates a safer work environment (e.g., the operator can call the individual on-site and remotely operate the device instead of the line crew using a hot stick), and allows the field crew to address other outages earlier (more efficient).<sup>195</sup>

Thus, a disconnect exists between the way in which FirstEnergy presented these benefits within the business case and their current explanation of how DA is delivering operational benefits.

### **Outage reduction (blue sky)**

The outage reduction component of this benefits category drives a majority (\$1.5 million / \$1.6 million for the original business case) of the expected savings.

Each line item in this section relies on inputs classified as “FirstEnergy Estimate” or hard-coded, requiring that an auditor or any user of the spreadsheet obtain explanations from FirstEnergy as to the source of these data and assumptions.

This category suffers from the same auditability difficulties as the sections discussed immediately above, in that it is a benefit driven by labor savings and is not in alignment with FirstEnergy’s offered stance as to the operational benefit of the DA technology.

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<sup>195</sup> Set 4 DR 16.

## **B. Benefits unpacking: Perspective on this review**

The example above is provided to illustrate the point that the set of benefits as presented by FirstEnergy in the Grid Mod I filing<sup>196</sup> contains at least one that is in our opinion not auditable. Daymark notes that the remaining benefits contain several others which bear fundamental similarities to the DA operational benefit examined with respect to the ability to audit key assumptions.

The first DA operational savings which we have discussed here represents one of twenty-two operational benefit and non-operational benefit categories. Our brief treatment above represents a fraction of the work needed to make a meaningful conclusion as to FirstEnergy's achievement of this benefit category. Further, any potential conclusion would need to acknowledge confounding factors: most readily for this example, that FLISR is not expected to go to automatic mode until Q4 2022.<sup>197</sup>

Daymark considers the IVVC and DA business case model discussed herein to be largely emblematic of the remaining supporting analyses which took the form of spreadsheets: the AMI business plan model, the ADMS business case model, and the Platform Benefits Engineering Study. Daymark found these spreadsheets, which as itemized in Appendix 1 – CBA Assumption Sources underlie numerous benefit calculations, to be labyrinthine and containing undocumented assumptions. When the sources of data, the assumptions pertaining to that data, and the transformations done upon the data are not transparent, the source is not conducive to use in an audit context.<sup>198</sup>

Daymark urges stakeholders to advocate for more straightforward and transparent representations of benefits within future phases of grid modernization investment such that the level of benefit achievement is more readily ascertainable upon the Companies' presentation of the appropriate evidence.

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<sup>196</sup> Daymark notes that the Grid Mod I filing and associated cost-benefit analysis were strongly incorporative of prior proposals and business cases.

<sup>197</sup> Set 4 DR 28 Attachment 1.

<sup>198</sup> Daymark additionally offers that the phased approach of grid modernization investment envisioned may require resources internal to FirstEnergy to continue to utilize the business cases; Daymark cannot speak to existing resources' familiarity with the spreadsheet analyses but notes that their design does not appear to be conducive to transferability.

## APPENDIX 5 – RELIABILITY METRICS

The Companies' reporting of the number of DA events, theoretical customer minutes saved, and theoretical customer interruptions saved are deficient as the sole documented evidence of DA-related reliability outcomes. The DA reliability benefits (as well as the platform investment benefits) are predicated on the concept that the investment will result in improved reliability outcomes, on average, in terms of the outage frequency (SAIFI) and outage duration (SAIDI) that customers actually experience.

Using an event analysis approach as the Companies have done rather than treating circuit-level outcomes is a misapplication of statistical concepts and represents an observational fallacy. As an analogy, the Companies' CMI/CI saved approach within the Grid Mod I metrics and Collaborative decks is akin to making a traffic safety-related improvement to a road and then choosing to analyze exclusively the set of accidents post-install and the ways in which the improvement *may have*<sup>199</sup> reduced the severity of those accidents.

However, the statistically appropriate way to evaluate the performance of such an improvement would be to compare the combined number/severity of accidents pre- and post- improvement. In both the traffic analogy and the electric reliability case, such an analysis would be rife with confounding factors; for example, road-to-road/circuit-to-circuit differences or weather-related factors for both. The electric utility industry has long dealt with these factors in evaluating utility reliability performance and a major investment such as distribution automation should not be cause for departure from these principles.

Daymark believes the Companies should be required to adjust their methodology to report on SAIFI/SAIDI performance of the DA circuits and concordantly take industry best-practice steps to control for confounding factors.

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<sup>199</sup> Such an analysis would necessarily be a counterfactual analysis; the specific accidents under review did not occur with the prior traffic situation, and thus one can only speculate as to the nature of the accident in a world without the improvement. Similarly, each of the events the Companies have analyzed to report on DA benefits has not occurred on a circuit lacking SCADA-capable reclosers; therefore, the Companies can only estimate the differences in restoration outcomes between the two scenarios.

## APPENDIX 6 – CURRENT GRID MOD I REPORTING METRICS

Daymark includes below the list of the Grid Mod I metrics as currently being tracked<sup>200</sup> by FirstEnergy for reference.

**Table 7. Current Grid Mod I reporting metrics<sup>201</sup>**

#	METRIC	DEFINITION
<b>AMI / Meter Metrics</b>		
<i>Physical Meters</i>		<i>Metric Definition</i>
1	Certified meters	The number of AMI meters installed, communicating, and available for billing. <ul style="list-style-type: none"> <li>Meters certified each month</li> </ul>
2	AMI meters installed, but not certified	The number of AMI meters installed, but not communicating and considered Active. <ul style="list-style-type: none"> <li>Meters installed each month that have not been certified</li> </ul>
3	Certified smart meter failures	The number of certified AMI Meters that are replaced each month due to fatal errors.
4	Meters salvaged or sold (#)	The number of meters sent to salvage or sold. <ul style="list-style-type: none"> <li>Meters (physical count) retired and replaced with an AMI meter and sent to salvage or sold each month.</li> </ul>
5	Meters salvaged or sold (\$)	The salvage or sale value of legacy meters retired and replaced with an AMI meter.
6	Meters transferred (#)	The number of legacy meters retired and replaced with an AMI meter and transferred between Operating Companies. <ul style="list-style-type: none"> <li>Meters (physical count) salvaged or transferred each month</li> </ul>
7	Meters transferred (\$)	The dollar value of legacy meters retired and replaced with an AMI meter and transferred between Operating Companies.
<i>Meter Reading</i>		<i>Metric Definition</i>
8	Manual Meter Reads	The number of meter reads conducted by an individual on-site for monthly billing. Broken into the following categories: AMR and Non-emitting. <ul style="list-style-type: none"> <li>Number of meter reads requiring reader to physically read meter, each month in grid mod deployment area (excluding pilot area)</li> </ul>
		AMR
		Non-emitting
9	Successful ("actual" for the purpose of billing) AMI meter reads	Total of actual reads recorded from AMI meters, excluding pilot
10	Meter readers employed by CEI/OE/TE, expressed in FTEs	Number of meter readers (expressed in FTE) employed by the Companies each month
11	Meter readers employed by external contractor, expressed in FTEs	Number of meter readers (expressed in FTE) employed by contractor each month
<i>Data Access &amp; Utilization</i>		<i>Metric Definition</i>

<sup>200</sup> Note: certain metric categories are still awaiting available data and/or methods to calculate.

<sup>201</sup> Set 4 DR 25 Attachment 1.

#	METRIC	DEFINITION
12	Web Portal CEUD Downloads	Number of customers who have accessed customer energy usage data through the web portal each month
		Residential - # of unique AMI billed certified customers accessing graphical daily usage data.
		Residential - # of unique AMI billed certified customers accessing hourly usage data via Green Button.
		Non-residential -
13	HAN Authorized Devices	Number of customers who have authorized the connection of home area network (HAN) devices, including a break out of devices by category, each month
		SSI Relay MPG
		Emporia Vue
		Rainforest
14	CRES Data Access	Number of customers who have authorized CRES access to customer energy usage data each month
		Total number of customers with certified AMI meters who have not opted out of the Eligible Customer List (ECL).
		The number of customers with certified AMI meters whose hourly usage data was accessed by a CRES provider.
15	Time of Use (TOU) Rate Offerings	Number of TOU rate offerings available to SSO customers with certified AMI meters each month
		Residential
		Non-residential
16	TOU Participation	Number of SSO customers with certified AMI meters participating in TOU rate offerings each month, including a subtotal of customers with authorized HAN devices, broken out by rate type.
		Residential
		Non-residential
17	Enabling Technologies	Rebates or incentives available for enabling technologies, e.g. smart thermostats; number of devices provided to each customer class, broken out by technology.
18	Net Metering	Number of customers taking service under the net energy metering rider each month
19	Net Metering (AMI)	Number of customers with certified AMI meters taking service under the net energy metering rider each month
20	Shopping Levels	Number of customers with certified AMI meters shopping each month, broken out by customer class
		Residential
		Non-residential
	Billing Related	Metric Definition
21	Residential bills issued	Number of residential bills issued each month, system-wide
22	Residential bills based upon estimated read	The number of estimated customer bills for all customers. <ul style="list-style-type: none"><li>• Number of estimated residential bills issued each month, system-wide</li></ul>
23	Customers eligible for disconnect due to non-pay (System)	Number of customers eligible for disconnection each month, system-wide

#	METRIC	DEFINITION
24	Customers eligible for disconnect due to non-pay (Grid Mod Deployment Area)	Customers with an AMI meter eligible for disconnection each month, excluding pilot AMI customers
25	Non-Pay Disconnects (System)	Number of customers disconnected due to non-pay each month, system-wide
26	Non-Pay Disconnects (Grid Mod Deployment Area)	Customers with an AMI meter installed disconnected due to non-pay each month, excluding pilot AMI customers
27	AMI Meter Tampering Cases (#)	Number of AMI meter tampering cases found each month, system-wide
28	AMI Meter Tampering Case Investigation Outcomes (\$)	Outcomes of AMI meter tampering investigations, including any monetary value identified each month, system-wide.
<i>Customers Impact Measures</i>		<i>Metric Definition</i>
29	Total call center calls	Number of call center calls received each month, system-wide
30	Call center calls related to meter reading	We will provide a value based on Investigation orders type for check reads initiated from the call center. <ul style="list-style-type: none"> <li>Number of call center calls related to meter reading received each month, system-wide</li> </ul>
31	Call center calls related to billing complaints	We will provide a value based on Investigation orders type for HI/LO Bill - Cust Complaint initiated from the call center. <ul style="list-style-type: none"> <li>Number of call center calls related to billing complaints received each month, system-wide</li> </ul>
<i>DA Metrics</i>		
<i>DA Circuit Metrics</i>		<i>Metric Definition</i>
32	Circuits equipped with DA	Number of circuits with DA infrastructure installed each month
33	Circuit Information	For circuits equipped with DA, breakdown of circuit load by customer class or rate schedule.
		Residential (CE-RS) - MWh
		General Service - Secondary (CE-GS) - MWh
		General Service - Primary (CE-GP) - MWh
		General Service - Sub-Transmission (CE-GSU) - MWh
		General Service - Transmission (CE-GT) - MWh
		Street Light (CE-STL) - MWh
		Traffic Light (CE-TR) - MWh
		Private Outdoor Light (CE-POL) - MWh
34	DA opportunities	Number of opportunities for DA to operate each month, system-wide
35	DA successes	Number opportunities when DA operated as intended each month, system-wide
36	DA failures	Number opportunities when DA did not operate as intended each month, system-wide
37	ADMS Utilization	The number of DA circuits that are fully functional based on integration with the ADMS.
38	ADMS Utilization	The number of circuits on which specific ADMS functions are operational, broken out by function, i.e. fault location, isolation, and service restoration, conservation voltage reduction, volt-ampere reactive controls, etc.
		Fault location

#	METRIC	DEFINITION
		Isolation
		Service restoration
		Conservation voltage reduction
		Volt-ampere reactive controls
	<i>DA Operational Efficiency Gains</i>	<i>Metric Definition</i>
39	Truck rolls related to an outage	Number of truck rolls related to an outage each month, system-wide
40	Outage-related truck rolls avoided	Number of avoided truck rolls related to an outage each month, system-wide
	<i>DA Direct Customer Benefits</i>	<i>Metric Definition</i>
41	Customer Minutes saved from self-healing events	Total customer minutes interrupted avoided monthly due to successful self-healing events
		Major Event Days
		Blue Sky / Minor Storm Days
42	Customer interruptions saved from self-healing events	Total customer interruptions saved each month due to successful self-healing events
		Major Event Days
		Blue Sky / Minor Storm Days
	<i>IVVC Metrics</i>	
	<i>IVVC Energy Efficiency</i>	<i>Metric Definition</i>
43	MW saved due to IVVC	Total MW saved due to IVVC per month, system-wide
44	MWh saved due to IVVC	Total MWh saved due to IVVC per month, system-wide
45	Average system voltage	For IVVC Circuits only, the average of the voltage at the substation on the secondary side of regulation.
46	Average circuit voltage	For all IVVC circuits, the average circuit voltage profile to demonstrate the meter performance of the IVVC equipment during different modes of operation.
	<i>IVVC GHG Impact</i>	<i>Metric Definition</i>
47	Reduction in greenhouse gases due to IVVC (estimate)	Estimated reduction in greenhouse gases due to IVVC per month, system-wide, based on 2016 EPA eGRID data

## APPENDIX 7 – DATA REQUESTS



## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-1	1	What types of grid modernization equipment and services is FirstEnergy implementing under its Grid Mod I plan? In addition to the list of equipment, please provide their commercial information or brochure usually developed by the manufacturer.
PAC-1	2	For the equipment and services identified above, please provide the planned schedule for the implementation during the Commission review process. If the planned schedule were revised during the implementation of Grid Mod I, please provide these revised schedules as well.
PAC-1	3	Refer to Commission Order in Case No. 16-481-EL-UNC, et al. dated July 17, 2019 (Order), Page 14, paragraph 29 and further refer to the Commission Order, Page 50, paragraph 97 which states, "The Companies further argue that the Stipulation provides substantial benefits to customers and the public interest as demonstrated by a positive \$1.98 billion (nominal), \$234 million (NPV), resulting from the Companies' cost-benefit analysis for a 20- year period." Please provide the analysis and all workpapers produced supporting the positive cost-benefit, on net present value, of Grid Mod I. Please include all years of benefit realization.
PAC-1	4	Refer to the Commission Order, Page 14, paragraph 30 stating, "... when appropriate, the Companies should utilize competitive procurement methods to acquire Grid Mod I assets." a. What are Companies processes of procuring Grid Mod I assets? b. How are the Companies ensuring competitive methods are being utilized for acquiring Grid Mod I assets?
PAC-1	5	Refer to the Commission Order, Page 16, paragraph 36 which states, "The Companies will install 700,000 advanced meters along with the necessary supporting communications infrastructure, a MDMS, and associated systems and process." a. What methodology was used to determine where the 700,000 advanced meters would be installed? b. With the 700,000 installed meters being split between territory of The Companies, how was the allocation of the advanced meters to be installed amongst The Companies determined? c. Please provide the map of where AMI was to be deployed as determined in the stipulation.
PAC-1	6	Refer to Commission Order, Page 17, paragraph 40 which states, "The Companies will install DA on at least 200 circuits and IVVC on at least 202 circuits, after collaborating with Staff to identify and select the circuits for DA and IVVC investments in order to maximize customer benefits." a. Please provide the methodology and assumptions used to select the circuits that DA and IVVC would be installed on. b. Please provide the methodology used to determine the allocation of these circuits amongst The Companies different service territories. c. Please provide a map showing the location of which circuits were selected for DA and IVVC installation. d. Please provide any documentation relating to the collaboration between The Companies and PUCO Staff in determining which circuits would be selected for DA and IVVC installation.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-1	7	Please provide monthly installation numbers of equipment installed since the approval of FirstEnergy's Grid Mod I by the Commission under Case No 16-481-EL-UNC & Case No 17-2436-EL-UNC. Please provide the data in spreadsheet format with clearly defined columns and with formulae intact for any values that are derived based on any relationship. In the spreadsheet, please provide further breakdown of monthly installed equipment by Companies (Ohio Edison, Toledo Edison, and Cleveland Electric Illuminating).
PAC-1	8	Please provide maps showing where the advanced meters have been installed to date, amongst the Companies.
PAC-1	9	Please provide maps showing which circuits DA and IVVC have been installed on to date.
PAC-1	10	Please provide status update on advanced customer portal and ADMS system that are planned under Grid Mod I.
PAC-1	11	Please comment on how the status of installation of assets and services under Grid Mod I is ongoing compared with the planned schedule during Companies' filing and subsequent stipulation order. If the status is different than what was planned, please provide primary reasons for the actual scheduled being different than what was originally planned.
PAC-1	12	For the assets remaining to be installed, please provide planned monthly installation counts by equipment types and Companies in a spreadsheet format.
PAC-1	13	Please provide maps showing where the advanced meters are being planned to be installed at a future date, within Grid Mod I.
PAC-1	14	Please provide maps showing the location as to where future circuits will have DA and IVVC installed.
PAC-1	15	When do FirstEnergy envision successfully completing the Grid Mod I investments? Please comment how this end date compares with the planned schedule under the stipulation and subsequent Commission Order? Please provide further reasoning if the envision actual end date is different than the planned date.
PAC-1	16	Please provide monthly capital spend associated with the Grid Mod I. In addition, please break down the monthly capital spend to date by types of equipment & services considered under Grid Mod I separately for the three Companies.
PAC-1	17	Refer to Commission Order, Page 20, paragraph 47: How does the capital spend to date compare with total capital spend of \$516 million allowed in the Order?
PAC-1	18	Refer to Commission Order, Page 16, paragraph 32: Please explain Companies' method/process to identify and track incremental operation and maintenance (O&M) that are actual, demonstrable, and truly incremental to the O&M costs collected in base rates.
PAC-1	19	Please provide the types of incremental O&M costs incurred during the implementation of Grid Mod I.
PAC-1	20	For the incremental O&M costs identified above, please provide monthly incremental O&M costs Grid Mod I cost incurred to date. Please provide the further breakdown of incremental O&M costs by categories (These categories may include, but not limited to, breakdown of incremental O&M costs by installed grid modernization equipment or efforts necessary to retire, salvage non-AMI meters).

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-1	21	Refer to Commission Order, Page 17, paragraph 38 which states, “The Companies will propose a time-varying rate offering for non-shopping customers, which will be designed to achieve the energy and capacity savings detailed in the cost-benefit analysis and should leverage enabling devices.” Please provide the proposed time varying rate and the assumptions used to determine this rate.
PAC-1	22	Refer to Commission Order, Page 18, paragraph 40 which states, “The Companies will work with the Signatory Parties to identify best practices and utilize technologies to achieve energy savings associated with the deployment of IVVC with the objective of achieving four percent energy savings when Grid Mod I technologies are fully deployed.” a. Please provide the best practices identified through collaboration with the Signatory Parties. b. To date, what percent annual energy savings has the Companies realized?
PAC-1	23	Refer to Commission Order, Page 19, paragraph 45 which states, “Operational savings that are produced by the investment and accrue to the Companies will be credited against the revenue requirement of Rider AMI during the quarterly update and reconciliation process.” Please provide the quarterly operational savings, for each of The Companies, that have been produced by the investment to date.
PAC-1	24	Refer to Commission Order, Page 19, paragraph 45 which states, “For the first three years of Grid Mod I deployment, the amount of the credit will be fixed at: Year 1 - \$0.05 million; Year 2 - \$0.90 million; and Year 3- \$3.28 million.” Has the annual cap been exhausted each year to date?
PAC-1	25	Refer to Stipulation and Recommendation, Attachment C, in Case No. 16-481-EL-UNC, dated November 9, 2018 & refer to page 8 of Supplemental Stipulation dated January 25, 2019: please provide monthly values of all performance metrics separately by Companies since the start of Grid Mod I. Please provide this information in a spreadsheet format with formulae intact for any derived values.
PAC-1	26	Refer to Stipulation and Recommendation, Attachment C, Case No. 16-481-EL-UNC, dated November 9, 2018, where applicable, please provide the monthly values of the performance metrics by Companies for 2017 – 2021 period.
PAC-1	27	Refer to Commission Order, Pages 17 and 18, paragraph 43 states, “Performance metrics will be included in the workpapers submitted to Staff in support of the Rider AMI quarterly updates.” Please provide the quarterly updates and workpapers, mentioned above.
PAC-1	28	Refer to Commission Order, Page 34, paragraph 71 which states “the Companies will file an application to revise their reliability performance standards within six months of a final Commission order approving the Stipulation.” Please provide a copy of the revised reliability performance standards along with any supporting documents.
PAC-1	29	Has FirstEnergy tested installed DA systems under major storms/events? If yes a. Please provide the results of how DA system performed during the events. And how did this performance compare with the circuits without DA systems. b. Did FirstEnergy conducted any assessment analysis to determine the benefits of DA systems during the major storm/events? If yes, please provide the analysis. If no, please specify why not.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-1	30	What is Companies' process of assessing performance of circuits that have DA and IVCC systems? What are the metrics that the Companies are tracking to measure the performance of DA and/or IIVCC employed circuits? If metrics are being tracked, please provide a general idea of performance pre- and post- DA / IVCC deployment.
PAC-1	31	Refer to Commission Order in Case No. 16-481-EL-UNC dated July 17, 2019 (Commission Order), Page 16, paragraph 35: Understanding that the Companies created and facilitated the Grid Mod collaborative working group, please provide details and materials as it relates to the collaborative working group as outlined below. a. When was the group formed? And what is the charter of the group? Please identify the stakeholders involved with the Collaborative Group. b. Please provide the meeting materials along with the dates that the Collaborative Group has met in the past. c. Is the Collaborative Group planning to meet in the future? d. Has the scope of the collaborative working group expanded (or narrowed) since its formation?
PAC-1	32	Please provide the latest version of Companies' approved Rider AMI.
PAC-1	33	Refer to Commission Order, Page 15, paragraph 31: Please provide description along with supporting documents and assumptions used showing how all used and useful costs associated with Grid Mod I are recovered under the Companies' approved Rider AMI.
PAC-1	34	Refer to Commission Order, Page 15, paragraph 33: Please provide the filing documents submitted as part of Companies' annual Rider AMI audit application that include actual capital and incremental O&M cost records associated with Grid Mod I. Please include all annual Rider AMI filing where Companies included costs associated with Grid Mod I.
PAC-1	35	Refer to Commission Order, Page 15, paragraph 33: In the annual Rider AMI Audit applications identified above, please explain how following requirements were met. If applicable, please identify where the following requirements are addressed within the annual rider audit applications a. on-site inspections of new capital assets; tracing capital expenses from continuing property records, invoices, and other supporting documentation to the used and useful assets; b. verification of proper accounting and computation of annual property tax expense, state, local, and federal income tax expenses, and depreciation expense; c. verification that incremental labor O&M expense included for recovery in Rider AMI is only associated with employees dedicated to the Grid Mod I plan and in roles not already recovered in current base rates; d. verification that non-labor O&M expenses are incremental; verification of proper accounting for Rider AMI revenues; and e. verification that the Grid Mod I investments are used and useful and were prudently incurred, with any disputes to be resolved via the process agreed upon by the Signatory Parties.
PAC-1	36	Please provide FirstEnergy's AMI Rider quarterly updates showing operational savings associated with Grid Mod I investments credited against the revenue requirement and reconciliation process. Please provide these quarterly updates in the spreadsheet format for all period in which Grid Mod I related operational savings were passed through.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-2	1	<p>Please provide following information for 2016 – 2021 period separately for each company in a spreadsheet format. If possible, please provide these values at the monthly level. If not, please provide annual values. And please explicitly state the data type (monthly, annual based on monthly averages or year-end) in the provided spreadsheet.</p> <ul style="list-style-type: none"> <li>a. Number of customers</li> <li>b. Meter related <ul style="list-style-type: none"> <li>i. Number of meters by types</li> <li>ii. Average monthly Manual meter reads by types</li> <li>iii. Meter readers employed by CEI/OE/TE, expressed in FTEs</li> <li>iv. Meter readers employed by external contractor, expressed in FTEs</li> </ul> </li> <li>c. Billing related (provide monthly averages) <ul style="list-style-type: none"> <li>i. Residential bills issued</li> <li>ii. Residential bills based upon estimated read</li> <li>iii. Customers eligible for disconnect due to non-pay (System)</li> <li>iv. Non-Pay Disconnects (System)</li> </ul> </li> <li>d. Customer impact measures (provide monthly averages) <ul style="list-style-type: none"> <li>i. Total call center calls</li> <li>ii. Call center calls related with the meter reading</li> <li>iii. Call center calls related to billing complaints</li> </ul> </li> <li>e. Outages related <ul style="list-style-type: none"> <li>i. Number of truck rolls related to outages</li> </ul> </li> </ul>
PAC-2	2	What is the Companies methodology for identifying “avoided truck rolls related to an outage?” Please provide supporting documents including an example of such avoided event.
PAC-2	3	What is the Companies methodology for identifying “avoided customers minutes due to successful self-healing events?” Please provide supporting documents including an example of such avoided event.
PAC-2	4	What is the Companies methodology for identifying “customers interruptions saved due to successful self-healing events?” Please provide supporting documents including an example of such avoided event.
PAC-2	5	What is the Companies methodology for identifying “Total MW saved due to IVVC?” Please provide supporting documents including any mathematical relationship involved.
PAC-2	6	What is the Companies methodology for identifying “Total MWh saved due to IVCC?” Please provide supporting documents including any mathematical relationship involved.
PAC-2	7	What is the Companies methodology for identifying “Estimated reduction in greenhouse gases due to IVVC per month, system-wide?” Please provide supporting documents including any mathematical relationship involved
PAC-2	8	The method of estimating reduction in greenhouse gases uses 2016 EPA eGrid data. Considering that EPA eGrid data is updated every two years with 2020 data recently published, does the Company plan to update its methodology using latest available EPA eGrid data? If yes, please provide Company’s plan to update its methodology. If no, please state why.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-3	1	Understanding that 640,000 meters have been installed to date and the FirstEnergy is planning on installing a total of 715,000 meters, what is the breakdown of where the remaining 75,000 meters are going to be installed amongst the three operating companies?
PAC-3	2	Please describe CGR deployment to date as well as future planned CGR deployment and timing, as well as how they overlap with meter reading routes.
PAC-3	3	What is FirstEnergy's methodology in deciding how and which meters are repopulated (becoming transfer / reclaimed meters)? Please provide any supporting documents if available.
PAC-3	4	How does FirstEnergy's meter failure percentage relate to the industry's best practice standard? Please provide FirstEnergy's process for bench testing and sample selection for this process and validation of the accuracy?
PAC-3	5	How long typically is required for a deployed AMI meter to be certified for billing? Days / weeks / months?
PAC-3	6	Please provided annual year-end number of meter reading routes for each operating company for 2017 – 2021 period.
PAC-3	7	Please provide annual total meter reading costs for each operating company during 2017-2021 period.
PAC-3	8	What is the specific number of routes that will no longer exist due to the installation of AMI at the completion of installing all meters under Grid Mod I investments?
PAC-3	9	How many routes have been eliminated to date due to the installation of smart meters?
PAC-3	10	
PAC-3	11	
PAC-3	12	Can there be partial retirement / consolidation of routes as result of partial AMI coverage? Has there been any consolidation of routes to date? Please provide final number of meter reading routes estimated, separately by each company, after Grid Mod I is completed.
PAC-3	13	What will be the final meter reading routes remaining for each Company once Grid Mod I is completed? Is this a function of CGR deployment or something else?
PAC-3	14	DA & IVVC Installation: Please provide circuit selection analysis put together by FirstEnergy for identifying circuits for installing DA and IVVC technologies.
PAC-3	15	What reliable metrics are used for reviewing and selecting circuits for DA/IVCC installation? Are these the same metrics used to track DA activation benefits?
PAC-3	16	Has FirstEnergy done any analysis to estimate operational, customer, and all other savings when all planned DA are installed, and system is fully automated once ADMS is operational? How are the savings calculated and what assumptions were used? Please provide supporting documents.
PAC-3	17	Does FirstEnergy have a separate voltage conservation program in addition to the IVVC? If so, please provide details on this program.
PAC-3	18	Are there instances where FirstEnergy is tying DA schemes that involve more than two circuits? If so, please provide all examples of these instances.
PAC-3	19	Please provide the work papers on how the opportunity for DA activation was identified and how it resulted in reduced minutes and customer savings.
PAC-3	20	Please provide description for how a failed DA activation is defined.



## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-3	21	Are the three phase reclosers deployed as a part of DA (or other programs) capable of single-phase tripping? (e.g. triple / singles or 3/2/1 type reclosers)?
PAC-3	22	Please provide a project description or project scoping document for a representative DA project that fully describes each component deployed (including SCADA work, relays, etc.), upgrades to existing facilities / infrastructure done, reconfigurations needed, etc.
PAC-3	23	Please provide FirstEnergy's ideal (or "standard") circuit or ideal (or "standard") DA scheme used for planning.
PAC-3	24	Please provide any goals related to number of customers behind a protected device and how it related to the Company's DA work.
PAC-3	25	Are there GHG savings benefits and or targets that are included in the DA truck roll reduction metric? Or are those savings accounted for elsewhere?
PAC-3	26	Does FirstEnergy have a smart relay program apart of the Grid Mod Phase I program? If not, does the Company have a smart relay program that is separate from the Grid Mod Phase I program?
PAC-3	27	Is the program to reduce pod size a part of Grid Mod Phase I or a separate project? Are the sectionalization / reclose devices or other equipment deployed as a part of the pod size reduction program easily incorporated into future DA work (e.g. only needing reprogramming rather than needing new communications modules and / or comms infrastructure)?
PAC-3	28	Under Grid Mod I, Is FirstEnergy installing or planning on installing power quality meters or devices capable of capturing high frequency (subcycle) voltage and current waveforms to better understand the system power quality? If so, please elaborate on the amount planned to be installed. If not, has FirstEnergy considered installing power quality meters in the future?
PAC-3	29	Please provide working papers for anticipated savings, calculation methodologies, and assumptions from IVVC installation, once the functionality has been fully operational.
PAC-3	30	To what extent are DA and IVVC installation, commissioning, and or benefits dependent on AMI deployment?
PAC-3	31	For applicable performance metrics provided in response to Set 1-DR 25, Are the companies striving to achieve a certain target level? If so, please provide such milestones / target value for the applicable metrics.
PAC-3	32	Please provide fully loaded hourly wage of meter readers employed by CEI/OE/TE separately.
PAC-3	33	Please provide fully loaded hourly wage of Meter readers employed by external contractor separately for each company.
PAC-3	34	What type of communication and planning has occurred regarding integration of technologies installed in the Grid Mod I project?
PAC-3	35	Integration of technologies installed under Grid Mod I What are the Companies' plans in the implementation of these technologies (and their interoperability with smart meters)? Please provide supporting documents that FirstEnergy has produced for planning and seamless integration of various technologies.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-4	1	Regarding the ADMS platform that FirstEnergy team is planning to install during the Grid Mod Phase I, a. Please provide vendor (Oracle) provided information of the ADMS technology. b. Please list out all the capabilities of Oracle ADMS platform and please identify the ones that FirstEnergy is planning to utilize.
PAC-4	2	Does the grid connectivity model reside in ADMS or GIS, e.g., what is the system of record for grid connectivity?
PAC-4	3	How does FirstEnergy identify and track devices that have been installed, but not yet tested or failed to communicate with SCADA and ADMS? What is FirstEnergy's methodology for tracking devices in SCADA but not yet linked to the ADMS?
PAC-4	4	Once grid modernization efforts are completed, do operating companies plan to retire the existing DMS? And if so, what are the benefits associated with this retirement?
PAC-4	5	As discussed by [REDACTED] during the conversation with PA team on 1/14/2021, please provide FirstEnergy's internal roadmap outlining ADMS technology implementation plan and timeline to realize benefits associated with the ADMS technology.
PAC-4	6	Please provide FirstEnergy's timeline of fully integrate ADMS with MDMS platform. Additionally, please state the functionalities that will be achieved at the completion of Grid Mod Phase I.
PAC-4	7	Refer to Set 1-DR 25 Attachment 1 for the metrics in the Data Access and Utilization Sections (Metrics # 12 -20), please confirm if the numbers are monthly incremental or cumulative / to date total numbers.
PAC-4	8	Refer to Set 1-DR 25 Attachment 1 for Shopping Levels metric (Metric #20) and explain what "customers with certified AMI meters shopping each month" mean.
PAC-4	9	Please describe any active ongoing customer outreach, or historical customer outreach, that has occurred to inform customers of the data available to the customers due to Grid Mod Phase I.
PAC-4	10	Please provide a sample automated email report generated that alerts engineers to do a detailed study of outage events that involved a Distribution Automation device operation. Do these reports also highlight outages on circuits with deployed distribution automation equipment that have failed to operate due to communications systems being unavailable?
PAC-4	11	Please provide the criteria / guidance circulated to FirstEnergy engineers to determine which truck rolls are considered avoided truck rolls as a result of the distribution automation and which truck rolls are not considered avoided truck rolls.
PAC-4	12	Does FE have a sense of how many 3 phase trips in Toledo Edison were due to single phase faults (especially on those circuits with distribution automation equipment)? If so, any estimate of how many customers were impacted / customer minutes of interruptions were there?



## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-4	13	<p>Refer to the slide deck shared with Grid Mod Collaborative Meeting on January 13, 2022</p> <p>Refer to Slide 18 that includes information on VVO Pilot:</p> <p>a. What are the metrics tracked to measure the performance of the VVO Pilot? If applicable, please provide up-to-date collected performance data. If not, please provide the date when the metrics would be collected.</p> <p>b. Regarding these metrics, are there goal / target that FirstEnergy is planning to achieve from successful implementation of the VVO pilot? If so, please state the goal by each metric.</p> <p>c. What types of operational savings (\$) are expected from the VVO Pilot once it is fully operational? Please provide the types of operational savings along with targets.</p>
PAC-4	14	<p>Refer to the slide deck shared with Grid Mod Collaborative Meeting on January 13, 2022</p> <p>Refer to slide 7 and please provide the list of all 78 blue-sky (non-Storm) events occurred since the installation of DA technologies. For each event, please include all tracked performance metrics, including CMI saved, numbers of customer impacted, and average outage reduction minutes reduced.</p>
PAC-4	15	<p>Refer to the slide deck shared with Grid Mod Collaborative Meeting on January 13, 2022</p> <p>Refer to slide 8, please provide list of all 28 storm events occurred since the installation of DA technologies. For each storm event, please include all tracked performance metrics, including CMI saved, numbers of customer impacted, and average outage reduction minutes reduced.</p>
PAC-5	1	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to the Attachment D of Stipulation and Recommendation filed on Nov 19, 2018 and the operational savings included in AMI Rider Quarterly reconciliation workpapers Set 1-DR 33 Attachments (Excel row 26, "Est. Revenue Requirement" sheet tab): Please reconcile the annual operational savings included in both resources. Specifically, please provide supporting work papers to show how the operational savings agreed in the Stipulation and Recommendation was used to derive the annual operational savings presented in the quarterly reconciliation workpapers.</p>
PAC-5	2	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab "Est. Net Plant": Please explain the methodology used to determine the FERC accounts into which Grid Mod I Gross Plant costs are booked. Specifically, please describe any changes to historic accounting practices made to specifically account for the Grid Mod I Gross Plant additions. If applicable, please provide any documentation to support the accounting approach used in the Set 1-DR 33 Attachments.</p>

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
PAC-5	3	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab “Est. Net Plant”: Please explain whether the accounting practices used to book the Gross Plant additions related to Grid Mod I vary between operational companies. If yes, please explain the differences in these accounting practices between operational companies and provide any applicable documentation to support these different practices.</p>
PAC-5	4	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab “Est. Net Plant”: Are labor costs associated with Grid Mod investments to be capitalized under Gross Plant through the duration of the program? Or are some portion of labor costs not to be capitalized? Are a portion of the approved \$516M total CAPEX approved for recovery through the AMI Rider, or are capitalized labor costs in addition to this limit?</p>
PAC-5	5	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab “Est. Net Plant”: Please provide support for the accrual rates applied to the Gross Plant additions related to Grid Mod I. In the response, please explain if/how these accrual rates are modified to reflect the Grid Mod I Gross Plant additions.</p>
PAC-5	6	-
PAC-5	7	-
PAC-5	8	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab “Rate Calc” (Excel row 13): Please provide workpapers to support the derivation of the allocator “Revenue Requirement Allocation % per Schedule A (Excluding GT) from D Rate Case”. Please provide support both for the original derivation of the allocator prior to exclusion of the GT class as well as the derivation of the allocator with the GT class excluded. If applicable, please provide these workpapers in electronic format with all formula intact and calculations.</p>
PAC-5	9	<p>AMI Rider Reconciliation Workpapers</p> <p>Refer to AMI Rider Quarterly workpapers Set 1-DR 33 Attachments, sheet tab “Rate Calc” (Excel row 23): Please provide workpapers to support the derivation of the “Revenue Requirement Allocation % per Supplemental Stipulation”. If applicable, please provide the workpapers in electronic format with all formula and calculations intact.</p>
2	1	Please provide the Grid Mod I Monthly Financial Reports for all months from project inception to present.
2	2	Please provide the minutes and/or slide decks for the Grid Mod I Weekly Implementation Updates from project inception to present.
2	3	Please provide all Grid Mod I Quarterly Reports (performance metrics as per ¶43 of the July 12, 2019 Opinion & Order in Case Nos. 16-481-EL-UNC et al.) from project inception to present.
2	4	Please provide all slide decks and meeting minutes from the Grid Mod Collaborative meetings held from project inception to present.
2	5	Please provide a list of attendees at all of the Grid Modernization Collaborative meetings held to date.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
2	6	Please provide a list of the data owners or persons responsible for each of the metrics in the Grid Mod I quarterly reports. Where there is more than one person responsible, for example equivalent functions across each operating company, please indicate all individuals.
2	7	Please provide the work product related to prioritizing circuits for installation of DA and IVVC.
2	8	Has FirstEnergy prepared any organizational charts relating specifically to Grid Mod I implementation? If so, please provide.
2	9	Do any of the operating companies have organizational charts identifying roles within Grid Mod I implementation? If so, please provide.
2	10	Please provide overall organizational charts for Toledo Edison, Ohio Edison, The Illuminating Company, and the Emerging Technologies group. If these exist within a comprehensive FirstEnergy organizational chart, please indicate which pages pertain to each of the four business units.
3	1	[Implementation] Please provide an up-to-date status of AMI-related deployment (all pertaining to the Grid Mod I territory): a. How many advanced meters are in customer premises? b. How many of the meters in (a) have been certified? c. How many connected grid routers are installed? d. How many of these connected grid routers are commissioned? e. How many range extenders are installed? f. How many of these range extenders are commissioned? g. How many “clusters” of advanced meters are fully communicative out of the total number of clusters that exist? How many advanced meters themselves are fully communicative out of the total number of advanced meters?
3	2	[Implementation] What percentage of the 713,000 advanced meters are being distributed to each customer class (residential/commercial/industrial)? What is the overall number of accounts in each customer class for each of the Companies?
3	3	[CBA] See the Cost/Benefit Analysis, “AMI Benefits”, Benefit #2 – Revenue Assurance, Lines 4-5. a. Please describe what the 1.7 multiplier to meter accuracy and theft detection benefits from EIA are intended to represent. Please indicate the EIA publication or resource that this number was taken from.
3	4	AMI [Implementation] Please refer to PAC-1 005, where the Companies note that AMI installation was overlaid on circuits that had been identified for DA/VVC implementation: a. What percentage of the roughly 713,000 advanced meters were deployed on circuits that also contained DA/VVC, by Operating Company? b. To the extent that there were advanced meters rolled out to customers on circuits without DA/VVC investment under Grid Mod I, please indicate the Companies’ criteria for determining rollout areas. Did the Companies perform any prioritization based on advantage to meter reading expense or benefits related to TOU/TVR? If so, please describe that prioritization.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
3	5	[Implementation] Please refer to PAC Set-03 DR-004: a. Is the 0.5% benchmark an annualized rate? b. Please provide the annualized failure rate of smart meters under the Grid Mod I program.
3	6	[Implementation] Please refer to PAC-1 001 Attachment 2. The CGRs are capable of connecting devices like cap bank controllers, recloser controllers, etc. Do the Companies use them for this purpose or are they only used for AMI communications purposes? Do the DA/VVC devices use a different communications approach?
3	7	[CBA/Implementation] Please refer to the 2013 SGCC. Regarding the service outage management benefit, please provide a narrative account of how the following capabilities are incorporated or are planned to be incorporated into the Companies' operations: a. "Last gasp" capability b. Meter "pinging"
3	8	[Benefits] Please provide a narrative update to Metric #10. Is FirstEnergy still expecting to achieve the meter reader workforce reductions indicated in the Cost/Benefit (33 for CEI, 40 for OE, 10 for TE)? Are there any significant meter reader workforce transitions expected to occur in the remainder of 2022?
3	9	[Misc] Please describe the process by which the meter reader workforce is being reduced. Are employees typically transitioned to other roles? What percentage are able to do so and within what time frame? Have severance packages been offered to any meter reader employees as a result of the Grid Mod I workforce changes?
3	10	[Misc] Please see PAC Set 02-DR-001. Please provide the historical metrics for meter readers from 2016-2019 as indicated in part (b.)(iii-iv).
3	11	[Misc] Regarding meter services (Operational Benefit #2 under AMI): a. Are meter services employees employed by the operating companies? If so, please provide employment numbers, direct and contracted, from 2016-2022, similar to that which was provided under PAC Set 02-DR-001. b. Please provide the fully loaded hourly wage of meter services personnel employed by CEI/OE/TE.
3	12	[Misc] Budget/Variance Reports relating to metering: a. Please describe the budgeting process as it relates to metering functions within the Operating Companies. At what granularity do the Companies prepare/receive budgets for metering-related functions? Are meter reading and meter services separately enumerated? b. Please provide budget/variance reports for the years 2016-2022 for meter reading for each of the Companies, if applicable. c. Please provide budget/variance reports for the years 2016-2022 for meter services for each of the Companies, if applicable. d. If (b.) and (c.) are unavailable, please provide budget/variance reports for the years 2016-2022 for the Companies that mention meter reading and meter services in the greatest granularity.

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
3	13	<p>[CBA] Please refer to the Cost/Benefit Analysis, “AMI Op Savings”, Benefit #3 – Back Office:</p> <p>a. What back-office efficiencies are anticipated to be realized that lead to the hours savings shown in lines 8-9?</p> <p>b. Please provide a description of how the hours savings in lines 8-9 were calculated. For example, what is the total number of annual back-office hours for each of the Companies? What portion of these hours relates to meter-related activities? Did FirstEnergy rely on any benchmarks to understand potential savings? If so, please provide the source of such benchmarks.</p>
3	14	<p>AMI</p> <p>[CBA] Please refer to the Cost/Benefit Analysis, “AMI Op Savings”, Benefit #1 – Meter Reading, line (6) - Transportation:</p> <p>a. Does the transportation line item capture the mileage incurred by each meter reader on average?</p> <p>b. Please provide the cost per mile FirstEnergy assumes for its meter reading vehicles.</p>
3	15	[Benefits] From a programmatic level, please comment on the largest benefits that have been achieved by leveraging the AMI deployment to date. Please provide supporting data where available.
3	16	[Misc] Please identify the list of order types that the call center tracks.
3	17	[Misc] Please provide handle time targets for each of the order types. If the handle time targets have ever changed, please provide a history of handle time targets by order type for the years 2016-2022.
3	18	[Misc] Please provide handle time actuals by order type for the years 2016-2022.
3	19	[Misc] How many total agents does FirstEnergy currently employ? How many of these agents have been trained in advanced meter calls?
3	20	[Misc] How many hours does the training plan for agents to become capable of dealing with advanced meter calls take on average?
3	21	[Misc] Please provide the regulatory ASA requirements for handle times for the years 2016-2022.
3	22	[Misc] Please provide the call center business plan for the years 2016-2022.
3	23	[Misc] Does the call center record which calls are associated with customers with advanced versus traditional meters? If so, please indicate call volumes by order type for the years 2016-2022 pivoted by meter type (for example, in 2021, 20000 bill dispute calls from customers with advanced meters, 30000 bill dispute calls from customers with traditional meters)
3	24	<p>Misc] During our [REDACTED] interview with [REDACTED], it was mentioned that the call center has a “notes” function in which there may be indication of whether a caller has an advanced meter.</p> <p>a. For what purposes does call center management typically use the “notes” function?</p> <p>b. Please provide a list of the types of information included in the “notes” function. Provide examples for each order type.</p> <p>c. Has call center management performed any analyses related to calls with advanced meter vs. traditional meter indicated in the notes?</p>

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
3	25	<p>[CBA] See the Cost/Benefit Analysis, “AMI Benefits”, Benefit #1 – Time-Varying Rates, Lines 4-16.</p> <p>a. Please indicate the maximum participation achieved for the TVR in the CEI pilot.</p> <p>b. Is the design of the TVR in the CEI pilot equivalent to what the Companies have proposed for the Grid Mod I “stopgap” TVR? Please provide the most recent rate design for the CEI TVR pilot.</p> <p>c. Please describe how the Companies reconciled between the participation rates seen in the CEI pilot and those reflected in the 2013 SGCC to settle on a 10% maximum participation rate.</p>
3	26	<p>[Benefits] Are the Companies tracking any metrics relating to customer energy usage under the Companies’ TVR? What level of kWh savings and kW savings have been observed so far?</p>
3	27	<p>TVR</p> <p>[Implementation] Please comment on the Companies’ involvement with the development of TVR by CRES: Do CRES have access to the data they need to develop and roll out TVR offerings? If not, what is the timeline for them accessing such data?</p>
3	28	<p>[Misc] For the CEI pilot, do the Companies have information on the overlap of customers taking the TVR with those with smart home devices? If not, please provide the independent percentages of customers piloting the TVR and those with smart home devices.</p>
3	29	<p>[CBA] See the Cost/Benefit Analysis, “AMI Benefits”, Benefit #3 – Customer Energy Management. Regarding the Customer Energy Management program within the CEI Pilot:</p> <p>a. Please provide a reference to any key regulatory filings which address the program design of the Customer Energy Management program.</p> <p>b. Please provide any materials sent to customers pertaining to the Customer Energy Management program.</p> <p>c. Did the program require customers to have smart home devices to participate?</p> <p>d. Were there rebates offered for customers who purchased smart home devices?</p> <p>e. Is there a cap of rebates offered? Have these rebates continued to be offered during the Grid Mod I period?</p>
3	30	<p>Customer Energy Management</p> <p>[CBA/Benefits] See the Cost/Benefit Analysis, “AMI Benefits”, Benefit #3 – Customer Energy Management Line 2, as well as Grid Mod I Reporting Metrics #12.</p> <p>a. Is FirstEnergy able to provide an implied participation percentage in Customer Energy Management based on the number of customers accessing usage data? If so, please provide. If not, please describe the difficulties in doing so.</p> <p>b. Are there currently any plans to perform outreach or take other actions to increase customer participation in Customer Energy Management?</p>
3	31	<p>[Implementation] Was there a configuration or customization engagement with Itron to develop the MDMS to meet FirstEnergy’s needs? If so, please provide documents that indicate the customization/configuration that FirstEnergy requested.</p>

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
3	32	<p>[Implementation] Regarding the MDMS and its usage with the Operating Companies and Service Company:</p> <p>a. Please provide a list of business units within the Service Company or the Operating Companies which access the Ohio MDMS. If the system is modularized, please indicate which modules these business units have access to.</p> <p>b. For the above business units, please indicate how they are utilizing the data within the MDMS for their workflows.</p>
3	33	<p>MDMS</p> <p>[Implementation] Please see Grid Mod I Reporting Metric #14. Have customers been able to authorize CRES to access customer usage data, and have CRES accessed such data, or is this contingent on further progress in the Grid Mod I deployment? Please comment on why data is not available and the Companies' timeline for reporting this.</p>
4	1	<p>[Misc] Prior to the implementation of Grid Mod I, please indicate the prevalence of SCADA on each of the Companies' distribution circuits/substations narratively. For example, which Companies tended to have SCADA on which components? For CEI, please break out the pilot circuits.</p>
4	2	<p>[Misc] Please provide data relating to customers per protection zone (pods) for the set of circuits selected for DA investment under Grid Mod I. If pod sizes are not available, please indicate the number of customers and number of reclosers and sectionalizing devices on each circuit. Please provide figures for pre- and post-Grid Mod I investment states.</p>
4	3	<p>[Implementation] Do the Grid Mod I reclosers (both ABB and G&amp;W) differ from the Companies' standard recloser (e.g., for non-Grid Mod I circuits)? Identify key specifications and differences.</p>
4	4	<p>[Implementation] Was the SEL-651R-2 in use in the Companies' territories prior to Grid Mod I? If so, was it limited to the CEI pilot circuits, or has it been used elsewhere?</p>
4	5	<p>[Implementation] What key features does the SEL-651R-2 contain when compared to the standard recloser control for non-Grid Mod I circuits?</p>
4	6	<p>[Benefits] Do the Companies note in their DA event analyses the period of time taken for a distribution operator to perform the necessary action? If so, please indicate these intervals for each of the events in PAC Set 04-DR-014 Attachment 1.</p>
4	7	<p>DA</p> <p>[Benefits] Have the Companies performed any testing which estimates the incremental reliability benefits that may accrue once the FLISR application is running in the fully-automated mode? If so, please provide a description of the testing and the associated conclusion.</p>
4	8	<p>[Benefits] Please refer to (Daymark) Set 02-DR-003-Attachment 1, Metrics 39-40:</p> <p>a. Do the Companies track a "purpose" for each truck roll beyond "Outage-related"? If so, please provide a list of categories which describe the different types of truck rolls that occur.</p>
4	9	<p>[Benefits] Have there been any examples of failed DA activations so far? If so, please provide any event analyses performed.</p>



## APPENDIX 7- Discovery Questions

Set	Q	Data Request
4	10	<p>DA</p> <p>[CBA] Please refer to PAC Set 01-DR-003-Attachment 2, tab “DA Benefits” Line 20.</p> <p>a. Please provide a printout of the tool output resulting in the \$ Benefit / Circuit for each of the operating companies for each of Reliability Improvements and Storm Restoration.</p> <p>b. How were customer counts for input to the DOE ICE tool determined?</p> <p>c. Please provide a version of PAC Set 01-DR-006 Attachment indicating customer counts by class for each of the circuits selected for DA and VVC implementation.</p>
4	11	<p>DA</p> <p>[CBA] Please refer to PAC Set 01-DR-003-Attachment 2, tab “DA Benefits” Lines 9 through 17. Please refer also to the Companies’ CEI Smart Grid Pilot data.</p> <p>a. Please comment on how the circuits for which DA/smart grid reclosers were piloted within the CEI pilot were selected.</p> <p>b. Please provide reliability data for the CEI pilot circuits from the years 2000 to present, indicating when the installation of DA/smart grid reclosers occurred.</p> <p>c. Please indicate pre-pilot and post-pilot customer counts by circuit as well as pre-pilot and post-pilot recloser/sectionalizing device counts by circuit.</p> <p>d. Please provide the pre-pilot and post-pilot reliability metrics (SAIDI/SAIFI/CAIDI/CMI/CI, etc.) from which lines 11 and 16 were derived from the CEI Smart Grid Pilot. Please indicate on a circuit-by-circuit basis within the CEI Smart Grid Pilot.</p> <p>e. Does FirstEnergy anticipate reliability improvements to be linear (irrespective of starting SAIFI/SAIDI)? Did FirstEnergy consider any alternative approaches to calculating the SAIFI/SAIDI improvement? Why or why not?</p> <p>f. Do the “Current” metrics found in lines 10 and 15 reflect the average reliability of the set of deployment circuits? If not, please indicate how these figures were determined.</p>
4	12	<p>[Benefits] Please refer to PAC Set-04 DR-014:</p> <p>a. Please provide further details on the root cause (tree branch, car crash with pole, etc.) as well as restoration steps taken for Outage Event Nos. 12, 18, 86, 91, 93, and 97. Please also provide the work orders pertaining to the DA upgrades on these circuits.</p>
4	13	<p>DA</p> <p>[Benefits] Please see PAC Set 01-DR-006 Attachment 2 Confidential. Has the company continued to track circuit-level reliability data for the circuits on which DA has been deployed? If so, please provide reliability data (SAIDI/SAIFI/CAIDI/CMI/CI) for each of the Grid Mod I circuits for the years 2019-present. Please indicate the date at which each circuit completed SCADA recloser installation and commissioning. If not, please explain why not.</p>
4	14	<p>[Benefits] Please refer to PAC Set 01-DR-003-Attachment 2, tab “DA Op Savings”, “Benefit #1 – Inspections, Truck Rolls, Outages”:</p> <p>a. What are the mandated inspection requirements for each of the device types being installed as part of the DA and IVVC scopes?</p> <p>b. Have the Companies changed any inspection procedures? If so, please provide the prior and current guidance.</p> <p>c. Please provide a narrative description of how inspection activities have changed as a result of Grid Mod I investments on the selected circuits.</p>



## APPENDIX 7- Discovery Questions

Set	Q	Data Request
4	15	<p>[Benefits] Please refer to PAC Set 01-DR-003-Attachment 2, tab “DA Op Savings”, “Benefit #2 – Planned Outages”:</p> <p>a. Please provide a narrative description of the field resources and time needed to set up an example planned distribution outage for a circuit without DA-capable/SCADA assets.</p> <p>b. How many planned distribution outage events were done for each of the Companies for the year 2021?</p>
4	16	<p>[CBA] Please refer to PAC Set 01-DR-003-Attachment 2, tab “DA Op Savings”, generally:</p> <p>a. Please provide a narrative description of the impacts of the DA technology implementation on field crews’ activities.</p> <p>b. Are the Companies expecting to be able to downsize field crews as a result of operational efficiencies related to the DA technologies?</p> <p>c. Do the Companies utilize a tracking system to assist with maintenance work order management? Please indicate the fields that are associated with such a system and provide a sample work order, if possible.</p> <p>d. Please describe the prioritization process for maintenance work orders.</p> <p>e. Have the Companies performed any analyses of maintenance work orders to observe the impacts of the Grid Mod I technologies? If not, why not?</p>
4	17	<p>[Benefits] Please refer to PAC Set 03-DR-022 Attachments 1&amp;2:</p> <p>a. Please describe the utilization/driver of the transformer temperature monitoring being installed at the Fairfield site. Which Grid Mod I platform(s) is this telemetry being integrated into?</p> <p>b. Beyond the usage of the device telemetry (breakers, regulators, PTs, etc.) for the purposes of the DA platform, are the Companies leveraging this information for other applications? Please list all identified uses and the Companies’ status in utilizing. For example, do these added data streams provide efficiencies to substation maintenance?</p> <p>c. What was the driver of the reconductor scope on Fairfield W197?</p> <p>d. What is program PF listed in the detailed scope and cost category?</p>
4	18	<p>[Benefits] Please refer to the Grid Mod I Collaborative deck dated April 21, 2022, Slide #5:</p> <p>a. Please define under what circumstances a circuit is deemed complete.</p> <p>b. Are the Companies able to leverage the SCADA reclosers on circuits which are not deemed complete by the above definition?</p>
4	19	<p>[Misc] Please provide a copy of the CVR Technical Potential Study.</p>
4	20	<p>[Benefits] Please refer to the Collaborative Deck Dated January 13, 2022, Slide 18 pertaining to the VVO pilot.</p> <p>a. How did FirstEnergy determine which circuits would be utilized for the pilot?</p> <p>b. Please provide a summary of the software adjustments that have been identified through the VVO pilot effort.</p> <p>c. What was the average circuit voltage for each of the circuits in the pilot? What average circuit voltage has been achieved for each circuit under the CVR mode?</p> <p>d. Have the Companies attempted to measure CVR energy or capacity savings as part of the pilot? Why or why not?</p>
4	21	<p>[CBA] Please refer to PAC Set 01-DR-003-Attachment 2, tab “IVVC Benefits”, Benefit #1 “Energy Savings” Line 18.</p> <p>a. Please explain the basis for the 2% growth rate in energy savings. What effects is this intended to capture?</p>

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
4	22	<p>VVO/IVVC</p> <p>[CBA] Please refer to PAC Set 01-DR-003-Attachment 2, tab “IVVC Benefits”, Benefit #1 “Energy Savings” Lines 25-27 and PAC Set 01-DR-022:</p> <p>a. Have the Companies been able to achieve energy savings as a result of the IVVC implementation activities to date? Why or why not?</p> <p>b. At preparation of the Cost Benefit analysis, how did the Companies intend to begin leveraging the IVVC investments in Years 1-3 to produce energy savings?</p> <p>c. Please provide any internal or external documentation relating to any change in outlook for the timeline for beginning to capture Energy Savings benefits.</p>
4	23	<p>VVO/IVVC</p> <p>[Misc] Please refer to the September 3, 2021 Interim Report filed in 09-1821-EL-GRD et al. and the CEI Pilot reporting in general:</p> <p>a. Please provide the spreadsheet shown on page 6 with formulas intact.</p> <p>b. Please provide equivalent reporting spreadsheets for periods between Spring 2021 and present.</p> <p>c. Please describe FirstEnergy’s methodology for determining energy savings under the CVR mode for the CEI pilot. Does FirstEnergy collect voltage and current data at the substation exit and perform a comparison between periods of MnDm and MxPQ?</p>
4	24	<p>VVO/IVVC</p> <p>[Benefits] Consider the possibility of low voltages arising at customer premises due to or exacerbated by VVO operation in CVR mode:</p> <p>a. Prior to Grid Mod I investments, what procedures were followed to resolve a low voltage complaint?</p> <p>b. For circuits with VVO implemented, have these procedures been altered to address the complicating factor of the VVO modes?</p> <p>c. Do the Companies have a plan in place to track low-voltage complaints coincident with operation of the VVO in CVR mode? Why or why not?</p> <p>d. Is there an expectation that the service center will notify the system operators utilizing the VVO to relay complaints related to low voltage?</p>
4	25	<p>Miscellaneous</p> <p>Please provide updated Grid Mod I Reporting metrics for the period 4/1/2022 – present.</p>
4	26	<p>Please provide an updated version of the monthly capital spend, PAC Set 01-DR-016 Attachment 1.</p>
4	27	<p>Please provide an updated version of the incremental O&amp;M, PAC Set 01-DR-020 Attachment 1.</p>
4	28	<p>Please provide material from any Collaborative meetings held since April 2022, if applicable.</p>
4	29	<p>Please refer to (Daymark) Set-02 DR-02 Attachment 16</p> <p>a. Do performance tests result in batches of devices being considered “complete”? How large were the performance tests that occurred on 6/2 and 6/7?</p> <p>b. What is the NMS (listed as a cause for ADMS connectivity delays)?</p>

## APPENDIX 7- Discovery Questions

Set	Q	Data Request
4	30	[Benefits] Do the Companies currently track “false positive” service requests, i.e. where customers believe they are experiencing a grid-related service interruption and crews are dispatched to investigate what ends up being a customer-side issue? If so, please indicate the number of such occurrences for each of the Companies for the years 2015-present. If not, please indicate either how this scenario is avoided within the Companies’ procedures or what gaps exist in work order tracking which make identification difficult or impossible.
4	31	[Misc] Regarding the hardware that supports the pre-AMI manual reading operations: a. Please describe the hardware that supports the manual reading operations. b. Is there an annual cost to each handheld system? If so, what is that cost? c. Are there other components to the platform cost? Please describe the cost structure of such components. d. Have the Companies performed any analyses of the cost savings that would be expected to be achieved regarding reduced reliance manual meter reading equipment? If so, please provide such material.
4	32	Meters [Benefits] Please refer to PAC Set 03-DR-003. a. Has FirstEnergy prepared any analysis of average meter accuracy at time of testing for all meters being considered for transfer? Please provide the average meter accuracy for the recycled meters for each of the Companies, or explain why it is not possible to supply such a figure. b. Has FirstEnergy performed any other analyses of the accuracy tendencies of its traditional meters? Please indicate the approach and associated conclusions.
5	1	Please provide the full analysis prepared by Accenture in support of the Companies’ Grid Modernization Business Plan case.
5	2	Please provide any documents, studies, or workpapers which supported the Accenture analysis, if applicable
6	1	Please provide the avoided transmission and distribution (T&D) study which supported the Avoided T&D Benefit #4 for IVVC within the cost-benefit analysis (PAC Set 01-DR-003-Attachment 2 Confidential).
6	2	Please provide the engineering study which provided the input to the platform reliability improvement benefits on the “Platform Benefits” tab in the cost-benefit analysis (PAC Set 01-DR-003-Attachment 2 Confidential).

**This foregoing document was electronically filed with the Public Utilities  
Commission of Ohio Docketing Information System on**

**11/14/2022 10:20:23 AM**

**in**

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

Summary: Report regarding the Operational Benefits Assessment of FirstEnergy  
Ohio's Grid Mod I electronically filed by Mr. Evan D Syers on behalf of Daymark  
Energy Advisors, Inc.