BEFORE THE

PUBLIC UTILITIES COMMISSION OF OHIO

THE DAYTON POWER AND LIGHT COMPANY

CASE NO. 18-1875-EL-GRD
18-1876-EL-WVR
18-1877-EL-AAM

Distribution Modernization Plan

DIRECT TESTIMONY
OF LISA A. KRUEGER

- □ MANAGEMENT POLICIES, PRACTICES, AND ORGANIZATION
- □ OPERATING INCOME
- □ RATE BASE
- □ ALLOCATIONS
- □ RATE OF RETURN
- □ RATES AND TARIFFS
- ■ OTHER

ON BEHALF OF
THE DAYTON POWER AND LIGHT COMPANY

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I. INTRODUCTION

Q. Please state your name, employer and business address.

A. My name is Lisa A. Krueger. I am employed by The AES Corporation.

Q. What is your position and professional relationship with DP&L?

A. I am President of the US Strategic Business Unit ("SBU"), responsible for the AES' US generation units and its two US utilities, Indianapolis Power & Light ("IPL") and The Dayton Power & Light Company ("DP&L").

Q. How long have you been in your present position?

A. I joined AES and have been US SBU President since August 2018.

Q. What are your responsibilities in your current position?

A. I am responsible for the overall management of two utilities, DP&L and IPL, as well as other AES assets in the US.

Q. Will you describe briefly your educational and business background?

A. I received a Bachelor of Science degree in Chemical Engineering from the Missouri University of Science and Technology in Rolla, Missouri and a MBA from the Jesse H. Jones Graduate School of Business at Rice University in Houston, Texas.

I accepted my current position in August, 2018. From July 2016 through August 2018, I was an independent consultant to both AES and Cogentrix in various commodity commercial, risk, and regulatory strategies. From March 2014 to June 2016, I served as President and

CEO of Essential Power, a merchant power generation fleet in the northeast US where I led the financial turnaround associated with an ineffective hedging strategy.

Prior to Essential Power, I was a senior officer at First Solar, one of the world's largest photovoltaic manufacturers and system integrators, where I led various domestic and international market and business development plans. I helped position First Solar as an industry leader in sustainability and worked extensively with global stakeholders to support, advance and grow international and domestic solar markets.

Prior to joining First Solar, I held several positions with Dynegy Inc. and Illinois Power Company in commercial operations, environmental, health and safety, transmission system planning and operations, and generation system planning and operations.

Q. What are the principal purposes of this testimony?

A. The principal purposes of this testimony are to:

a. Explain DP&L's vision for grid modernization, and how DP&L intends to achieve that vision.

b. Explain that DP&L's ability to modernize its grid is contingent upon approval of DP&L's application to extend its Distribution Modernization Rider.

II. DP&L VISION AND IMPLICATIONS FOR GRID MODERNIZATION

Q. What is DP&L's vision for its future?

A. DP&L has developed the following vision for its future in service of customers and their ever-changing needs:

"Our customers will experience personalized, innovative & seamless energy services enabled by transformative technologies"

DP&L has created this customer-centric vision to guide the Company in its day-to-day planning and operations, and to ensure customers are at the heart of any and all decisions the Company makes. This vision also aligns with the two pillars of grid modernization laid out in PUCO's PowerForward Roadmap: i) innovation, and ii) enhance the customer electricity experience.[1]

Q. Please explain some of the trends influencing the Company's vision.

A. DP&L has always strived to deliver safe and reliable electricity to customers in the Miami Valley. However, as the Commission heard about in PowerForward, new and distinct customer segments are becoming identifiable, and customer demographics are changing. In the "not so distant future of the electric grid, customers will demand more control over their electric bill, more instantaneous services like those provided in other sectors (e.g., mobile banking apps), and different means of communications with utilities and service providers."[2] In order to realize its vision for the future, DP&L must provide an energy experience that is on par with customers' other retail experiences, and one that delivers on these emerging customer demands.

At the same time, like many utilities, DP&L is dealing with aging infrastructure. In 2017, the American Society of Civil Engineering gave the United States energy

[1] PUCO PowerForward: A Roadmap to Ohio's Electricity Future, Page 4.
[2] Id., Page 10.

infrastructure a "D+" grade in its Infrastructure Report Card[3], citing asset age and concerns over the infrastructure's ability to withstand severe weather events. As distribution assets near their end-of-life, there is an opportunity to invest in newer technology and grid modernization to improve reliability and resiliency for customers. In addition, Distributed Energy Resources ("DERs") such as solar photovoltaic systems ("PV"), customer-sited storage and direct load control devices will place further demands on the distribution grid. All are poised for rapid growth: Solar PV is projected to grow by 50% from 2018 to 2023,[4] customer-sited storage is projected to reach 3.3 gigawatts of annual deployment by 2023,[5] and electric vehicles ("EVs") are expected to reach approximately 35% of vehicle sales in the United States by 2030.[6] The growth of DERs and EVs, along with the proliferation of grid sensors and controllers such as smart meters and automated grid devices, are expected to drive exponential growth in the volume and types of data generated. As noted in PowerForward, "[t]he data generated needs to be used to better enable customer choice and to inform customers of their energy consumption and costs so they can manage their energy usage, adopt technologies that provide benefits and drive systemic benefits for the grid."[7]

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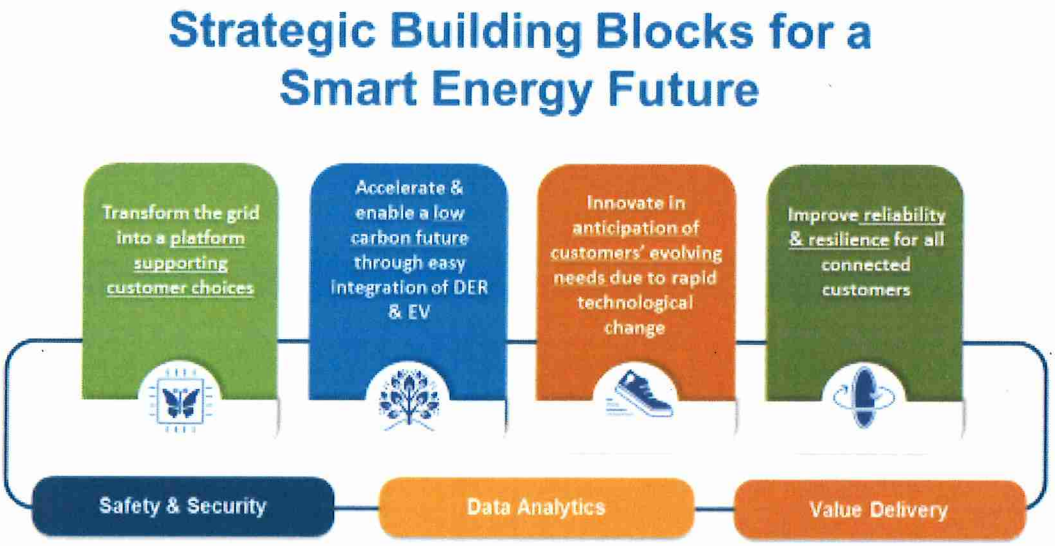
[3] American Society of Civil Engineers, Infrastructure Report Card, 2017, https://www.infrastructurereportcard.org/, (accessed November 27, 2018).
[4] SEIA, Solar Industry Research Data, https://www.seia.org/solar-industry-research-data, (accessed November 28, 2018).
[5] US Energy Storage Market Hits 1 Gigawatt-Hour Mark in 2017, Expected to Double in 2018, https://cleantechnica.com/2018/03/07/us-energy-storage-market-hits-1-gwh-mark-2017-expected-double-2018/,, (accessed November 27, 2018).
[6] Bloomberg NEF Electric Vehicle Outlook 2017.
[7] PUCO PowerForward: A Roadmap to Ohio's Electricity Future, Page 31.

Q. How does the Company intend to achieve its customer-centric vision through grid modernization?

A. Grid modernization is a critical component of delivering DP&L's vision for its future. To deliver on its customer-centric vision, the Company has identified four grid modernization support strategic building blocks and three foundational elements that will be critical to success in transforming the grid into a platform that supports customer choices. These are depicted in the figure below:



The strategic building blocks focus on the activities the Company needs to perform and the changes that will be required of the grid, providing the core priorities for DP&L's grid of the future. These activities will transform the grid into a platform supporting customer choices, accelerating and enabling a low carbon future via easy integration of DERs and EVs, innovating in anticipation of customers' evolving needs due to rapid technological change, and enhancing reliability and resiliency for all connected customers. The

foundational elements support all activities DP&L performs today, and will continue to be critical in the future evolution of the modern grid. The foundation elements are safety and security, data analytics, and value delivery.

Q. Is DP&L's vision consistent with principles identified on page 8 of the Commission's PowerForward Roadmap?

A. Yes. DP&L considered the principles identified by the Commission in developing its vision, and DP&L's vision is intended to advance those principles. DP&L plans to implement grid modernization so that the customer experience is significantly enhanced. Customers will have new and innovative ways to access information and make decisions about their account. Further, DP&L will implement numerous measures that will improve the reliability of the grid, which will benefit all customers.

III. DESIRED CUSTOMER BENEFITS FROM GRID MODERNIZATION

Q. Has DP&L defined what grid modernization will mean for customers?

A. Yes. To describe what grid modernization will mean for customers, DP&L has identified six primary customer benefits that the grid of the future aims to deliver.

Q. What are the six primary customer benefits?

A. The six primary customer benefits are as follows, with each described in more detail below:

Customers will experience…

1. personalized engagements, including optionality, at their convenience;

2. differentiated reliability to meet individual energy needs;
3. seamless integration of DERs onto the grid;
4. an increase in EVs for public and private use;
5. open access to the grid and grid data, including for third parties, and
6. open markets to navigate the rapidly evolving set of energy choices and solutions.

Q. Please describe the first desired customer benefit of personalized engagements, including optionality, at their convenience.

A. It is key that the grid enables delivery of simple and intuitive energy experiences for customers (e.g., one-click bill pay via an online portal, digital DER interconnection application and tracking, customized DR programs, etc.). Central to this seamless experience is the ability for customers to engage through digital and self-serve channels (e.g., web portal and app, proactive text alerts, near real-time tracking displays, etc.) and to buy products and services that specifically match their needs and wants.

Q. Please describe the second desired customer benefit of differentiated reliability to meet individual energy needs.

A. Beyond the reduction of the average reliability metrics that have been traditionally used to measure service performance for all customers (e.g., CAIDI, SAIFI), reliability also needs to be tailored to the individual customer to ensure the unique needs of each are met. Each customer's specific reliability needs must be understood and delivered in a manner that meets or surpasses expectations. For example, for residential customers with

sensitive digital devices, the grid should be able to operate in a manner that prevents any damage to these devices. For commercial and industrial customers, an additional focus on power quality should be provided. Similar to sensitive in-home digital equipment, DP&L should limit the impact of momentary or sustained outages as commercial and industrial customers move towards implementing more digitized workforce management approaches, advanced analytics, and artificial intelligence ("AI").

Q. Please describe the third desired customer benefit of seamless integration of DERs onto the grid.

A. Customers should be able to easily interconnect DERs to the grid, purchase and sell grid services, and have open and fair access to energy markets. Beyond individually-owned DERs, the grid should also be able to integrate more complex grid infrastructure such as micro-grids, community-scale solar, etc. This seamless integration can provide customers a variety of benefits including potential cost savings, greater choice, and the ability to reduce their carbon footprint. DERs are also important to commercial and industrial customers and could potentially translate into financial savings through lower consumption and energy costs, while also creating significant impacts beyond financial savings in the form of societal benefits. Further, an increased focus on green energy and DER encouragement has the potential to help attract new businesses and promote economic development.

Q. Please describe the fourth desired customer benefit of an increase in EVs for public and private use.

A. As EVs proliferate, DP&L must enable each customer to efficiently charge their individual EVs and use an electrified public transportation network to buy and sell energy and services. EV owners should be able to both charge and discharge seamlessly into the grid in the future, and thereby reduce their carbon footprint through ownership of a transportation method that provides cost savings and flexibility of choice (e.g., fuel related savings, lower long-term volatility in electric rates vs. gas prices, etc.). Beyond individual owners, electrification of public transit and creation of EV charging infrastructure can also help serve a more common public good for the communities with whom DP&L partners.

Q. Please describe the fifth desired customer benefit of open access to the grid and grid data, including for third parties.

A. With increases in DERs, EVs and other customer-sited solutions, the grid increasingly needs to operate as a platform for integration of both utility and non-utility assets. The future of the grid as a platform can only be realized for all grid participants through open access to the physical infrastructure of the grid, as well as to associated grid data. Of course, this still requires complying with security and privacy rules and regulations to maintain safe and secure operations. Open access for grid participants (e.g., customers, 3rd party providers, and other stakeholders) enables greater choice as participants begin to make data-based decisions regarding energy usage and their desired level of interaction. Not only will customers be equipped with the information to make better choices, but this

open and free participation enables collaboration between grid operators and third parties to improve grid design. Open access can enable participation in new business models through coordination with third-party providers in the energy marketplace.

Q. Please describe the sixth desired customer benefit of open markets to navigate the rapidly evolving set of energy choices and solutions.

A. The evolution of the distribution grid into a platform with an ecosystem of interconnected grid participants enables the creation of a robust marketplace as described in PowerForward.[8] In the future state, customers should be able to buy and sell energy and energy-related products and services through such an integrated marketplace. This marketplace could support an array of energy products and services across spot (e.g., real-time), medium and long-term term (e.g., day or month ahead) markets similar to today's RTO/ISO markets. Eventually, financial products could also begin to trade in the market to help better structure the energy products and aid customers in hedging their risks. Individual customers should be able to leverage fair and open pricing mechanisms to transact both with providers and peers. Moreover, commercial and industrial customers could co-create meaningful and valuable products and services and potentially explore new streams of revenue with other interested third-parties. As a result, the grid could enable the marketplace as a one stop shop for all electric utility needs for customers (e.g., energy efficiency and demand management, hedging and trading, etc.).

[8] PUCO PowerForward: A Roadmap to Ohio's Electricity Future, Page 9.

IV. DP&L'S DISTRIBUTION MODERNIZATION PLAN ("DMP")

Q. Can you identify the principal components of DP&L's DMP?

A. Yes. There are eight principal components of DP&L's DMP:

1. **Smart Meters** – The installation of Advanced Metering Infrastructure ("AMI"). The plan and benefits of AMI are described in Witness Storm's testimony.

2. **Self-Healing Grid** – The implementation of distribution automation, substation automation and supporting systems that will provide a self-healing grid. Those components are described in detail in Witness Gebele's testimony.

3. **Customer Engagement** – DP&L's plan to provide its customers an opportunity to interact with the utility and the grid in new and improved ways and provide education regarding all of its DMP components. The details on the customer engagement aspect of DP&L's plan is described in the testimony of Witness Tatham.

4. **Enhancing Sustainability and Embracing Innovation** – This includes the system and processes that DP&L will use to manage the accommodation of DERs connected to its distribution grid as well as the implementation of sustainability projects that include community solar, storage and microgrids. Additionally, DP&L is proposing plans that will encourage adoption of EVs. This component is covered within the testimony of Witness Hall.

5. **Telecommunications** – The expansion of DP&L's telecommunications capabilities to ensure reliable and robust communication with all of the field

devices that are proposed as part of its DMP. The details of this section are covered in Witness Gebele's testimony.

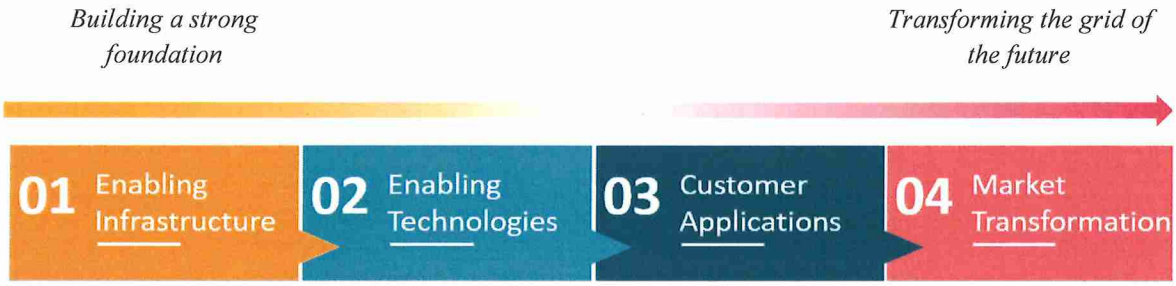
6. **Physical and Cyber Security** – This component covers the appropriate security measures and upgrades necessary to protect DP&L's equipment and data as well as customer data. DP&L's plan for security is described in the testimony of Witness Fuller.

7. **Governance and Analytics** – This component includes the program and project management required for successful execution of the DMP, as well as the rigor around systems integration and testing. Additionally, the DMP will drive such a transformation for both the grid and its users that a strong change management approach will be required. Lastly, the various devices and technologies that are proposed as part of DP&L's DMP will provide a significant quantity of data in the future. To successfully deliver the benefits of the DMP to DP&L's customers, DP&L is proposing an Analytics Center of Excellence that will drive the consolidation and analysis of data from the various devices and systems. This will support improved and more efficient operational decision-making as well as ensure customers have access to information upon which to make the best energy-related decisions for their lifestyle. These topics are covered in the testimony of Witness Hulsebosch.

8. **Grid Modernization R&D** – This includes the research, development and engineering that has been necessary to develop DP&L's robust DMP. This component is covered in Witness Hall's testimony.

Q. Does DP&L's approach to modernizing the distribution grid align with the objectives identified on page 9 of the Commission's PowerForward Roadmap?

A. Yes. DP&L's approach to modernizing the distribution grid is a continuum that will ultimately provide the desired outcomes outlined by the Commission in its PowerForward Roadmap. The figure below depicts the Company's continuum beginning with building a strong foundation and moving toward a full market transformation:



Moving from left to right, enabling infrastructure and technologies set the foundation for a strong distribution grid that is "reliable and resilient, optimized and efficient and planned in a manner that recognizes the necessity of a changing architectural paradigm."[9] Furthermore, enabling infrastructure and technologies lead to the development of the grid as a platform with secure open access for relevant parties. As this foundation is put in place, it naturally enables enhancement of customer choices on the application side, allowing customers to engage as they desire. Finally, as customers begin to have more choice and become more engaged, this lays the path for market transformation allowing "innovative products and services to arise organically and be delivered seamlessly to customers by the entities of their choosing."[10]

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[9] PowerForward: A Roadmap to Ohio's Electricity Future, Page 9.
[10] Id.

Q. Does DP&L's plan build the foundation for a strong, modernized grid?

A. Yes. DP&L's plan includes a number of assets to help collect information all the way down to the edge of the grid, as well as to remotely monitor and control assets to improve operations and efficiency in near real-time. For example, smart meters, smart switches, capacitor banks, power flow controllers, and telecommunications infrastructure are just some of the assets that will be put in place through the Plan. The information collected from these types of assets can help deliver the desired customer benefits through availability of that information and its use to improve planning and operations. Furthermore, the ability to remotely monitor and control distribution devices will enable applications such as Conservation Voltage Reduction ("CVR") and Volt-VAR Optimization ("VVO") to improve energy efficiency and reduce energy demand as described by Witness Gebele.

The DMP also includes a number of digital solutions that are critical to gathering, visualizing, and analyzing data. These solutions will improve decision-making both in real-time operations as well as in long-term planning and asset management. Some examples include, but are not limited to, the Advanced Distribution Management System ("ADMS"), the Meter Data Management System ("MDMS"), and the Mobile Workforce Management System ("MWFM"). Witnesses Hall, Gebele and Storm provide more detail on DP&L's DMP, including upgrades and/or replacements of grid assets and digital technologies.

Building a strong foundation also includes a continued focus on customer engagement and improvement in customer experience. Consistent with the PowerForward recommendations on delivering the "customer's way," DP&L's DMP includes upgrades to the Customer Relationship Management ("CRM") tool, improvement of the customer portal and mobile app, implementation of Time-of-Use ("TOU") rate structures, and deployment of pre-pay options, amongst other solutions. Witness Tatham provides more detail on how DP&L's Plan includes solutions to improve customer engagement.

Lastly, it is critical to note that DP&L is making improvements to physical and cyber security to enable a strong infrastructure focused on the delivery of an enhanced customer experience. The testimony of Witness Fuller includes DP&L's plan for enhancing physical and cyber security.

Q. What else is included in the filing beyond building the foundation of a strong, modernized grid?

A. DP&L's DMP includes several elements that extend beyond building the foundation of the strong, modernized grid, but which also help deliver the desired customer benefits. For example, DP&L is building a limited amount of EV charging infrastructure, utility-scale battery storage, a micro-grid pilot, and community solar to expand the types of assets integrated to the grid. This will not only serve customers, but will also build the Company's knowledge and skills in anticipation of future resource integration onto the grid. To manage the growth of DERs in particular, DP&L has also included a DERMS in the Plan to manage optimization of the highly-decentralized grid of the future. Outside of

DERs and EVs, DP&L is investing in a third-party management platform. This platform will leverage enhancements in CRM, the web portal, ADMS, and other digital solutions to engage third parties as they begin to participate in the grid of the future markets. Witness Hall provides details on some of these additional elements in the plan.

Q. Does the Company's DMP help deliver the six primary desired customer benefits described above?

A. Yes. Holistically, the Plan helps deliver the six primary customer benefits I previously described. For example, smart meter data combined with other customer solutions such as CIS, CRM and Advanced Analytics will help increase personalization of customer engagements. Greater visibility into the grid through DA, SA, and associated digital solutions such as ADMS (including DERMS) can enable more differentiated reliability, while also aiding in seamless integration of DERs and EVs. Further, additional aspects of the Plan, such as the third party data and management portal (CRES portal) will enable more open access to the grid and grid data, as well as future support of markets for energy products and services. The testimony of Witnesses Hall, Gebele, Storm, and Tatham provide more details on the specific elements in the Plan and the benefits they are expected to deliver for customers.

Q. In addition to the eight principal components of the Company's DMP, are there elements to deliver the Company's vision that are not included in this filing?

A. Yes. Some items to deliver the Company's vision were identified as relatively nascent, and/or further out with respect to implementation timing. For those solutions, DP&L's

intention is to let them further develop while the Company implements more foundational solutions. This will allow DP&L to perform a more accurate assessment of their cost/benefits as external factors and customer behaviors evolve, while also incorporating guidance and input from key groups such as the Commission-established collaboratives and working groups.

Q. Please briefly describe some of these items that DP&L expects to be pursued beyond this filing.

A. Additional grid modernization solutions to deliver the vision beyond this filing include:

Localized asset enhancements: Grid investments to improve resiliency and hardening on the last mile to enable increased penetration of DERs and EV on specific circuits.

DERMS enhancement: Enhancement and scale up of DERMS to support a greater number of DERs across the grid.

Digital WFM 4.0: Expansion of digital workforce management technologies such as augmented reality in the field, virtual reality for training, and increased drone use to inform asset management/planning.

Market management system: Implementation of a bid management and settlement system to facilitate transactions as the grid develops into a platform for future markets at the distribution level (e.g., DLMP).

Dynamic pricing tools: Deployment of systems and solutions to enable more complex locational pricing at distribution nodes using real-time grid operational data.

Data management layer / data lake: Creation of a data management layer (e.g., a data lake) to support analytics on the growing volume of data and information available from the grid.

Advanced analytics expansion: Expansion of the advanced analytics function to make greater use of information and data available for targeted use case and benefits delivery.

These aspects of the plan are still being developed, and over time the Company will continue to refine them to determine the appropriate time to propose and implement them.

V. GRID MODERNIZATION AND THE DMR-E

Q. Is the DMP dependent upon DP&L's existing Distribution Modernization Rider ("DMR")?

A. Yes. DP&L's DMR is a foundational component leading to DP&L's ability to implement this vision for grid modernization, which will provide meaningful customer benefits through a robust, modernized electric grid. Without the existing DMR, DP&L would not be in a position to make the grid modernization proposal in this filing. Further, DP&L's ability to carry out grid modernization consistent with the PowerForward initiative is contingent upon a continuation of the DMR. Put simply, the two initiatives (DMP and DMR Extension ("DMR-E") go hand in glove. For this reason, DP&L will shortly be filing an application to extend its Distribution Modernization Rider for an additional two-year period. DP&L's ability to make the investments to further the goals of the PowerForward initiative and provide the substantial benefits to its customers through grid

modernization is dependent upon securing the DMR-E at an appropriate level. The DMP combined with the DMR-E represents a carefully crafted package that will allow DP&L to provide transformative technology and services to DP&L's customers, assist the Company in continuing to resolve its financial integrity issues, while creating a sustainable business model going forward.

VI. CONCLUSION

Q. Does this conclude your testimony?

A. Yes, it does.

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Summary: Testimony Direct Testimony of Lisa A. Krueger electronically filed by Mr. Jeffrey S Sharkey on behalf of The Dayton Power and Light Company