Part 2

WITNESS DIRECT TESTIMONY SUMMARY

Witness: Edward H. Baine

Title: Senior Vice President – Distribution

Summary:

Company Witness Edward H. Baine introduces the Company's proposed plan to transform its electric distribution grid (the "Grid Transformation Plan," the "GT Plan," or the "Plan") and explains the needs driving the Plan. He also provides an overview of the first three years of the Plan ("Phase I") for which the Company seeks approval through its petition for approval of electric distribution grid transformation projects filed pursuant to Va. Code § 56-585.1 A 6.

Mr. Baine explains why the investments proposed in Grid Transformation Plan are necessary to address the structural limitations of the Company's distribution grid in a systematic manner in order to recognize and accommodate fundamental changes and requirements in the energy industry. He details both system needs and customer needs and expectations for (1) achieving even higher levels of reliability and resiliency against natural and man-made threats; (2) leveraging technology to enhance the customer experience and improve the operation of the system; and (3) safely and effectively integrating new utility-scale renewable generation and storage as well as customer-level distributed energy resources. Mr. Baine also provides context for the Grid Transformation Plan, providing background on the current state of the Company's electric distribution grid and explaining why now is the optimal time for the Grid Transformation Plan.

Mr. Baine then provides an overview of the Grid Transformation Plan. Specifically, Mr. Baine explains that the Company has created a ten-year plan to transform its electric distribution grid into a smarter, stronger, and greener grid. The Company envisions the Grid Transformation Plan to proceed in interdependent phases, with each phase building upon the last. During Phase I of the Plan, the Company will focus on seven components of the overall Grid Transformation Plan, many of which are foundational to a transformed grid: (i) smart meters; (ii) customer information platform; (iii) reliability and resilience; (iv) telecommunications infrastructure; (v) cyber and physical security; (vi) predictive analytics; and (vii) emerging technology. Importantly, Mr. Baine described how the various components of the Grid Transformation Plan are critically interdependent.

Finally, Mr. Baine outlines the benefits of the GT Plan, which fall into three primary categories: (i) increased reliability and resiliency; (ii) improved customer experience; and (iii) reduced components of cost of service. Beyond these primary benefits, the GT Plan will likely also lead to other societal benefits, such as reduced emissions, job creation, and economic development. Mr. Baine provides the total proposed investment estimate associated with Phase I of the Grid Transformation Plan. He explains why the proposed investments are reasonable, prudent, and necessary to meet the needs of the Company's customers, both now and for many years to come.

DIRECT TESTIMONY
OF
EDWARD H. BAINE
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUR-2018-00100

Q. Please state your name, business address and position of employment.

A. My name is Edward H. Baine and my business address is 120 Tredegar Street, Richmond, Virginia 23219. I am Senior Vice President – Distribution for the Power Delivery Group of Dominion Energy, Inc. ("Dominion Energy"). A statement of my background and qualifications is attached as Appendix A.

Q. What are your management responsibilities with respect to Virginia Electric and Power Company ("Dominion Energy Virginia" or the "Company")?

A. I am responsible for all facets of Dominion Energy Virginia's regulated electric distribution business that provides electricity to over 2.6 million customer accounts in Virginia and northeastern North Carolina.

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

A. The purpose of my testimony is to introduce the Company's proposed plan to transform its electric distribution grid (the "Grid Transformation Plan," the "GT Plan," or the "Plan"), and to explain the needs driving the Plan. I will also provide an overview of the first three years of the Plan ("Phase I"), for which the Company seeks approval through its petition for approval (the "Petition") of electric distribution grid transformation projects filed pursuant to § 56-585.1 A 6 of the Code of Virginia ("Va. Code"). Finally, I will introduce the Company's other witnesses in this proceeding.

Q. During the course of your testimony, will you introduce an exhibit?

A. Yes. Company Exhibit No. __, EHB, consisting of Schedules 1 through 2, was prepared under my supervision and direction and is accurate and complete to the best of my knowledge and belief. Schedule 1 shows selected quantifiable projected benefits of the Grid Transformation Plan. Schedule 2 includes the projected capital and operations and maintenance ("O&M") investments for Phase I of the Grid Transformation Plan, as well as a ten-year forecasted total capital and O&M investments for the full Plan.

I. Summary of Need for the Grid Transformation Plan

Q. Can you explain why the Company is proposing a Grid Transformation Plan and seeking approval of Phase I of the Plan in this proceeding?

A. Certainly. The essence of the Company's obligation as a public utility is to provide electric service to its 2.5 million Virginia customers in a safe, reliable, cost-effective, and environmentally responsible manner. Meeting evolving customer service needs and expectations is an important part of this mission as well. Against that backdrop, Dominion Energy Virginia has consistently made prudent investments in its electric distribution system and has achieved a strong and improving record of system reliability and customer service across a spectrum of performance metrics, all at rates that are just and reasonable and that compare favorably to our peer utilities.

What we recognize, though, is that just as our generation system resources have been expanded and improved—indeed, transformed—over the past decade for the benefit of our customers (and will continue along this path), so too must we now address the structural limitations of the Company's distribution grid in a systematic manner in order to recognize and accommodate fundamental changes and requirements in our industry. We must meet

both system and customer needs and expectations for (1) achieving even higher levels of reliability and resiliency against natural and man-made threats; (2) leveraging technology to enhance the customer experience and improve the operation of the system; and (3) safely and effectively integrating new utility-scale renewable generation and storage as well as customer-level distributed energy resources ("DER") such as rooftop solar and battery storage. The Grid Transformation Plan will enable an electric grid designed originally for one-way flow of energy from dispatchable generation resources to accommodate a new world of distributed energy resources and rapidly changing customer preferences for how they manage their electric usage, along with the changing nature of their demands and expectations for power.

The investments proposed with the GT Plan are also essential to ensure the systems and infrastructure that power our daily lives and drive the sustainability and growth of our economy are positioned to adapt to future needs and complexities. As a result of these investments in the electric grid, a new and versatile energy platform will be enabled through which Dominion Energy Virginia can deliver increasingly safe and reliable power to customers, while also remaining adaptive to new innovations and emerging developments in the energy landscape.

In the end, we believe that the public policy underlying the Grid Transformation and Security Act of 2018 ("GTSA"), which supports qualifying investments as being in the public interest, is of critical importance to our customers and the Commonwealth overall. The Company's GT Plan will adopt a staged approach to deploy interdependent components that will result in a smarter, stronger, and greener electric distribution grid.

The Plan will benefit our customers, will meet their needs today, and will prepare us to continue to meet those needs in the future.

The Company submits that Phase I of the Grid Transformation Plan, and the associated capital and O&M investments, are reasonable and prudent and asks that the Commission so find in approving the Petition.

Q. You mentioned fundamental changes in the energy industry, can you elaborate on those changes?

A. Yes. As an initial matter, modern society increasingly relies on electronic and connected devices for nearly all functions of daily life. In other words, the electric power grid is the critical foundation for practically every aspect of functioning in today's world. Vital community resources rely increasingly on electricity, from education and health care systems to the banking and transportation industries. While service interruptions have always been an inconvenience, the safe, reliable, and consistent delivery of power has never been more important than it is today.

In the meantime, technology has developed that can provide electric utilities with increased situational awareness on their systems. For example, intelligent grid devices can transmit information to the utility that will allow for understanding of the real-time status of the grid and for identification of at-risk equipment, which can lead to proactive repairs, minimizing or avoiding service disruptions to customers. We must additionally be aware that as society grows more dependent on electricity, so too do the threats to this critical infrastructure. Accordingly, utilities must also make investments in its physical and cyber security that can meet the evolving nature of the threat landscape.

The customer base in our industry has also changed. Customers want access to more information, and want the flexibility to access that information over different channels of communications. New technology has made meeting these needs possible. Nearly 80 million smart meters have been deployed across the country, allowing for the collection of data that can provide customers the ability and control to make informed decisions about their energy usage. Available customer information systems have evolved that can leverage data from smart meters. These new customer information systems will enable integration with technology used by our customers and provide an improved customer experience.

Finally, the demand for electricity generated from renewable energy resources has increased. Many customers demand it, and many legislative and regulatory pronouncements encourage it, including here in Virginia. In contrast to conventional power sources, renewable energy sources can connect directly to the distribution grid. As I noted earlier, the Company's existing distribution grid was originally designed for one-way flow of electricity; the grid was not designed with the direct connection of generation sources in mind. While the Company has worked diligently to adapt its system to meet these modern needs, the existing system has structural and operational limitations that the Company must address.

Q. So what are the main drivers behind the Grid Transformation Plan?

A. The main drivers behind the Grid Transformation Plan include:

1) Improving resiliency and reliability: the need to strengthen distribution grid infrastructure and modernize systems to drive increased reliability and increased resilience to outages;

2) Increasing situational awareness: the need to effectively monitor and operate the evolving and increasingly complex grid infrastructure;

3) Evolving customer expectations: the need to meet changing customer expectations for easy and convenient access to more information about their energy use, more choices for managing and controlling it, and more engagement options;

4) Increasing physical and cyber security: the need to adapt and respond to emerging risks and threats to our systems, data, and critical infrastructure, particularly given the importance of such infrastructure to the Commonwealth and the nation;

5) Integrating renewable energy resources: the need to facilitate the integration of renewable energy resources in the context of expanded adoption of DER while maintaining safe and reliable energy distribution to all customers; and

6) Preparing for emerging technology: the need for more flexible, modernized infrastructure that can adapt to known and anticipated new technology and developments in the energy industry.

Q. Can you explain how the proposed Grid Transformation Plan will meet these needs that have driven its development?

A. Of course. Starting with the need to strengthen and modernize the grid, the Grid Transformation Plan will enable communication between intelligent grid devices, automated control systems, and supporting technologies. The Plan also includes grid hardening activities. Together, these improvements will result in a modernized and interconnected distribution grid that allows for proactive management of assets and performance, prevents certain outages, and enables speedier recovery times when outage events and storms occur. These improvements will also meet the increased need for

situational awareness of the grid by improving system controls and automating certain portions of the system.

The Grid Transformation Plan will also meet the need to increase physical and cyber security in response to emerging risks and threats by executing a comprehensive, multi-layered physical and cyber security strategy to proactively address the threat landscape faced by the energy sector. The grid situational awareness enabled by a modernized and interconnected grid will also help with detection and recovery from cyber and physical security events if they do occur.

Q. How will the Grid Transformation Plan meet evolving customer expectations?

A. The Grid Transformation Plan will enable a wide range of capabilities, such as new scalable rate structures, expanded self-service options, and more customer-centric programs. The Plan will enable the Company to offer these new capabilities through the deployment of a modern digital customer information platform. For example, customers will be able to choose their preferred method of communication, and then receive high usage alerts when their energy usage exceeds a certain level.

Q. Will the Grid Transformation Plan meet the need to adapt to renewable energy resources and provide the Company with the flexibility to adapt to new technology?

A. Yes. The increased situational awareness discussed above will enable the Company to effectively interconnect and operate the grid with DER, ensuring that the intermittent output from these resources does not pose threats to voltage stability and system operations and reliability.

The investments proposed in the GT Plan will also provide the Company with more options to integrate a wide range of emerging technologies. For example, electric vehicles continue to gain popularity. A transformed grid will allow the Company to intelligently manage the increased demand for electricity needed to charge electric vehicles and incorporate batteries and microgrids in a manner that benefits all customers.

Q. Please summarize the need for the Grid Transformation Plan.

A. The Company recognizes that customer expectations are quickly evolving and that significant changes will be required to improve reliability, address resilience, enhance security, integrate renewable resources, and improve the overall customer experience. The grid must adapt in order to meet these expectations.

II. Context for the Grid Transformation Plan

Q. Please describe the Company's existing electric distribution grid.

A. The Company's existing distribution grid consists of more than 52,000 circuit miles of overhead and underground cable, and over 400 substations. The existing infrastructure was originally designed for one-way delivery of energy to meet customers' demand—from the generator, through the transmission system, to the distribution grid and the end-use customer. The existing grid was not designed to effectively integrate the ever-increasing amount of renewable generation, including customer-level DER that feeds directly into the distribution system.

As of May 2018, approximately 80% of the Company's customers have automated meter reading ("AMR") meters, approximately 16% of customers have smart meters, and approximately 4% of customers have manual read meters. The Company installed the

AMR meters in the 1997 to 2005 timeframe. The Company collects data from the AMR meters on a monthly basis primarily by having trucks drive through neighborhoods. In 2009, the Company began to deploy smart meters in a targeted fashion, as further discussed by Company Witness Brett A. Crable.

Q. Can you describe the current customer information system supporting the distribution services of Dominion Energy Virginia?

A. The Company manages its customer accounts primarily through a customer information system installed about 22 years ago. Customers that have AMR meters can see their energy usage information when billed for it after-the-fact. Customers can access certain information about their accounts online through dominionenergy.com, or can receive information monthly through the mail. The Company also staffs customer contact centers. When an outage occurs, customers must notify the Company of the outage.

Q. Does the Company's existing electric distribution grid perform well?

A. Yes. Over the years, Dominion Energy Virginia has consistently made prudent investments in its electric distribution grid to ensure safe and reliable service to its customers. The Company has achieved a strong record of system reliability and customer service across a spectrum of performance metrics, all at rates that are just and reasonable and that compare favorably to our peer utilities. For example, on a three-year average, the Company's customer contact center delivered an average speed of answer of 40.17 seconds for 2015 to 2017. This represents a 19.2% improvement over the previous three-year average from 2014 to 2016. In 2017 the Company's customer contract center delivered the lowest overall average speed of answer on record of 27.3 seconds. As another example, as measured by a three-year rolling average of system average interruption duration index

("SAIDI") excluding major events, the Company has reduced the time without service for customers by more than 17% since 2006.

To achieve these results, the Company has made full use of its past investments. The Company has worked diligently to prioritize reliability investments and leverage its existing systems.

Q. Despite this record of performance, are there limitations to the current grid?

A. Yes. AMR meters provide limited information to the Company and its customers, requiring field visits for metering and other basic service orders, and limiting the options for more advanced customer rates. The existing customer information system cannot accommodate the incremental volume and complexity of customer interactions and options that a modern digital distribution grid entails.

As to the infrastructure itself, the Company has limited situational awareness and visibility into the grid based on the somewhat limited assets, control systems, and connectivity for real-time monitoring. More fundamentally, as I previously mentioned, the distribution grid was originally designed for the one-way flow of power, so it has limitations in adapting to the two-way power flow created by DER. Supporting the integration of renewables and other aspects of a customer-focused platform will require new investments to create a step change in performance.

Q. Why is now an optimal time for a grid transformation plan?

A. For several reasons. Costs for the relevant technologies have decreased as peer utilities across the country have worked to transform their distribution grids. The Company has learned from the experiences of our peer utilities and has tested certain components of the

GT Plan on a smaller scale. The Company used this knowledge to develop the GT Plan, ensuring that its investments will be reasonable and prudent.

Further, the General Assembly recently recognized the importance of investments to transform the electric distribution grid in the Commonwealth with the passage of the GTSA, identifying such qualifying investments as being in the public interest. Indeed, the GTSA *requires* electric utilities to seek Commission approval for a plan for electric distribution grid transformation projects. Accordingly, the GTSA, as a matter of public policy, supports the optimal timing of the Company's Grid Transformation Plan.

III. The Grid Transformation Plan

Q. Please provide an overview of the Company's Grid Transformation Plan.

A. Dominion Energy Virginia has developed a ten-year plan to transform its electric distribution grid into a smarter, stronger, and greener grid. The Company envisions the Grid Transformation Plan proceeding in integrated phases, with each phase building upon the last. We also envision adjusting the proposed Plan as needed in future filings based on results and lessons learned from previous investments.

During Phase I of the Plan, the Company will focus on installing the foundational infrastructure that will enable all other components of the Grid Transformation Plan. Specifically, the Company will deploy smart meters across its service territory, along with the telecommunication infrastructure necessary to fully utilize the data generated by these smart meters. In addition to smart meters, the Company will also install automated control systems and other intelligent grid devices, such as automatic reclosers, line sensors, voltage control devices, and digital relays, all of which will also rely on robust telecommunication

infrastructure. During this process, the Company will also focus on grid reliability and resiliency. Specifically, the Company plans to harden mainline circuits, proactively upgrade equipment, and add more backfeed capabilities for restoration. The Company plans to invest in both physical and cyber security throughout the Plan, including during Phase I.

At the same time, the Company will begin the transition to a new customer information platform ("CIP") through which customers can engage with the Company across multiple channels of communication. This new platform will provide customers with access to detailed energy usage information based on data gathered from smart meters. With the new CIP, customers will be able to select their communications preferences, choose their bill date, and view their customized detailed energy consumption analysis. This information will also allow the Company to provide customers with more options, from expanded self-service options to new rate structures. Throughout the Grid Transformation Plan, the Company will focus on educating customers on how they can fully utilize the new capabilities of the transformed distribution grid.

As part of the GT Plan, the Company will leverage predictive analytics—that is, the practice of extracting information from existing and new data sets in order to determine patterns and predict future outcomes and trends for the ultimate benefit of customers. The Company has developed a comprehensive strategy for predictive analytics to sustain utility and customer benefits and unlock current and future grid benefits. This strategy centers on the creation and operation of the analytics center of excellence, which is comprised of a data analytics system and supporting organization.

The increased situational awareness enabled by this foundational infrastructure will allow for a greener grid. When deployed with the necessary operational systems, intelligent grid devices provide visibility into deployed DER within the Company's service area and support accurate load forecasting, voltage stability and control, and active monitoring of DER to maintain safe and reliable grid operations. These investments will make the grid more adaptable to a range of other emerging technologies such as electric vehicles, microgrids, batteries, and smart streetlights. The GT Plan will also make it easier for customers with DER, such as rooftop solar, to apply for connection to the grid.

Q. So the various components of the Grid Transformation Plan interrelate?

A. Yes they do. The components of the GT Plan are critically interdependent. The Company plans to deploy smart meters and intelligent grid devices as part of the GT Plan. These devices require secure telecommunications infrastructure to transmit the data collected. Further, the Company and its customers can only realize the benefits of these devices when used in connection with a resilient, secure, and self-healing distribution grid.

The Company must then have the systems in place to use the data collected by smart meters and intelligent grid devices to further leverage those investments, including the new CIP that will use the data collected in conjunction with other modern technology to enhance the customer experience. The analytics center of excellence will also use the data collected to assist the Company in making prudent investment decisions in the future creating additional customer benefits.

As mentioned, the infrastructure envisioned in the proposed GT Plan will make the distribution grid adaptive to the integration of renewable energy sources. For instance, the

intelligent grid devices and smart meters will enable the Company to remotely monitor voltage levels—which tend to fluctuate with the variable output from renewable energy sources—to ensure grid stability. Smart meters will allow customers who wish to install renewable energy sources on their premises to take advantage of a variety of customer programs.

In other words, all components of the Grid Transformation Plan are interrelated, interdependent on one another, and necessary to achieve the maximum benefit from the proposed investments.

Q. Is the Company's Grid Transformation Plan generally consistent with similar plans from peer utilities?

A. Yes. A recent survey conducted by BRIDGE Energy Group indicated that 73% of utilities are either implementing or developing grid modernization plans, up from 52% in 2017. For example, according to a November 2017 study, Commonwealth Edison ("ComEd") has deployed 2,600 smart switches and 4 million smart meters, and has been able to avoid over 4.8 million customer interruptions since 2012. Regionally, Baltimore Gas & Electric and Pepco have completed the majority of their smart meter deployment projects and are moving forward with other advanced grid modernization investments. As another example, Florida Power and Light reported a 60% improvement in average days out per customer following Hurricane Irma in 2017 compared to Hurricane Wilma in 2005, attributing the improvements to the significant investments made in grid hardening.

The Company has monitored these and other grid transformation efforts undertaken by peer utilities, which has informed the development of our own GT Plan.

IV. Standard for Approval, Customer Benefits, and Projected Costs of the Plan

Q. What is the standard for approval of the Company's Grid Transformation Plan?

A. The standard for approval of the Plan is contained in Va. Code § 56-585.1 A 6, which provides in pertinent part:

> A utility shall, without regard for whether it has petitioned for any rate adjustment clause pursuant to clause (vi), petition the Commission, not more than once annually, for approval of a plan for electric distribution grid transformation projects. Any plan for electric distribution grid transformation projects shall include both measures to facilitate integration of distributed energy resources and measures to enhance physical electric distribution grid reliability and security. In ruling upon such a petition, the Commission shall consider whether the utility's plan for such projects, and the projected costs associated therewith, are reasonable and prudent. Such petition shall be considered on a stand-alone basis without regard to the other costs, revenues, investments, or earnings of the utility; without regard to whether the costs associated with such projects will be recovered through a rate adjustment clause under this subdivision or through the utility's rates for generation and distribution services; and without regard to whether such costs will be the subject of a customer credit offset, as applicable, pursuant to subdivision 8 d.

Q. What is the Company's position as to how the Commission should evaluate whether the Plan and its associated costs are "reasonable and prudent"?

A. I am neither a lawyer nor an accountant, so I will defer on those aspects of the question. But I can certainly speak to it from a perspective based on my more than twenty years of experience as an engineer at the Company and based on my current role overseeing Dominion Energy Virginia's regulated electric distribution business.

Q. Please continue.

A. The Company's electric distribution grid is an essential component of our ability to meet both our statutory public service obligations and our customers' needs and desires for safe, reliable, cost-effective, environmentally responsible, and customer-friendly electric

service. We have always made investments that in our professional judgment, guided by experience and informed by many sources, are deemed reasonably necessary to meet those goals. These include investments to maintain the distribution grid and to upgrade the system as appropriate based on the physical needs of the grid and reasonable customer expectations. The distribution grid is a complex, interdependent network of field equipment, hardware, software, other infrastructure, and human support systems. The Company constantly analyzes these systems—on both a macro- and micro-level—to evaluate what investments should prudently be made for the benefit of our customers.

Q. You mentioned customer expectations. What role do they play in determining what reasonable and prudent investment decisions the Company makes for its distribution system?

A. The customer experience is paramount in my view. While Dominion Energy Virginia is the exclusive provider of electric distribution services within our service territory, that does not in any way diminish our focus on excelling at meeting reasonable customer expectations for reliable and customer-friendly service. Doing so is integral not only to our obligation as a public utility, but also to the physical and economic well-being of those individuals, families, businesses, and other organizations we serve, and of the Commonwealth as a whole. That focus has only grown sharper amidst the historic changes in our industry and rapidly evolving customer needs and desires that I discussed earlier.

Q. Does cost play a role in whether a proposed investment is deemed reasonable and prudent by the Company?

A. Of course it does. We evaluate investments based on many criteria, including cost. Our goal is to achieve the optimal level of investment, balancing system needs, customer expectations, and the goal of just, reasonable, and competitive rates for electric service.

Q. Is there a precise formula for determining what is reasonable and prudent?

A. I wish there was, but no. We have to be guided by an intimate and studied understanding of the state of technology, the operational aspects and constraints of the current system, various externalities, objective measures of customer sentiment, feedback from external parties, and our informed judgment as utility operators. We look to any number of criteria in making investment decisions, such as: what does experience teach us about the historic performance and vulnerabilities of the system; what constitutes a proven technology; what are the various options, and their respective costs and benefits to customers, to address the system needs; what are the experiences of our peer utilities; what new threats does the system face, from both individuals and nation states; and so forth. In the end, our ultimate goal is to answer this question with respect to these investments: "What would a prudent utility operator do, under the same or similar circumstances?"

Q. What role has the GTSA played in the Company's development of a Grid Transformation Plan?

A. Obviously this is an important public policy pronouncement by the General Assembly of Virginia representing the various interests of our customers throughout the Commonwealth, and it certainly informs—and in fact requires—our development of a grid transformation plan. I read it very simply as recognizing that there are needed investments

to our system in order for our customers' needs and those of the Commonwealth to be met going forward, and that utilities should act responsibly to develop a reasonable plan to do so for this Commission's consideration.

Q. Can this Plan be evaluated utilizing a formal cost-benefit analysis?

A. Not entirely, and I do not believe it would be appropriate to impose such a requirement for its approval.

Q. Why not?

A. In some cases, we do have objective, accepted measures of quantifiable benefits associated with investments proposed in the Plan. For example, it is clear that the type of targeted grid hardening activities proposed and the deployment of intelligent grid devices and automated control systems will result in improved reliability performance, which can be measured through the SAIDI and SAIFI metrics. These improvements directly translate into cost savings associated with avoided lost economic output using accepted methodologies such as the Department of Energy's Interruption Cost Estimate ("ICE"). Those savings alone amount to an estimated $2.0 billion for customers over a 20-year period. Likewise, we know that installing smart meters and associated infrastructure will reduce components of our customers' cost of service due to eliminated field visits and related activities. There are several hundred million dollars of easily quantifiable benefits along those lines as well. Schedule 1 shows a snapshot of selected quantifiable benefits over a 20-year period.

However, by no means should these benefits be assumed or judged to be the only customer benefits of the Plan. What are the benefits, for example, of intelligent grid devices, control

systems, and hardening activities designed to reduce, eliminate, or quickly recover from the prospects of a cyber or physical attack on the system? The benefits of avoiding or minimizing such threats—which could result in catastrophic consequence—are substantial, but they cannot be quantified. Similarly, can we put a dollar figure on the value to a customer, through smart metering and a new customer information system, of being able to receive real-time high usage alerts? Obviously there is great customer satisfaction value and potential savings resulting from such an enhanced feature, and it will enable decision-making that may also reduce customer energy usage. But such benefits are not easily or reliably converted to a dollar figure. Similarly, facilitating the incorporation of more renewable energy to the electric power grid also results in societal benefits that are difficult to quantify in traditional cost-benefit analysis.

In short, in addition to quantitative benefits, there are many qualitative or otherwise unquantifiable benefits to the GT Plan components, and the Plan as a whole. In addition, some of the proposed investments are foundational to others, and eliminating one component based on a traditional cost-benefit analysis will affect other components. Accordingly, I would urge the Commission to consider this full inventory of customer benefits as it evaluates whether the Company's proposed Grid Transformation Plan and the associated costs are in fact reasonable and prudent.

Q. Are these considerations unique to the GT Plan?

A. No they are not. They are inherent in many decisions surrounding distribution system maintenance and improvements that are made and that have been made for decades by public utilities. If we were to subject each such investment to a stricter cost-benefit

analysis, we could not do our job as utility operators and we would not meet reasonable customer expectations.

Q. So generally, what are the categories of benefits of the Grid Transformation Plan?

A. The benefits of the Grid Transformation Plan fall into three primary categories: (i) increased reliability and resiliency; (ii) improved customer experience; and (iii) reduced components of cost of service.

The GT Plan will increase reliability and resiliency of the electric distribution grid. The proposed investments will eliminate outage events, reduce the number of customers affected, and allow for faster restoration. Improved grid reliability equates to improved grid availability to receive and transmit the output of DER. Increased cyber and physical security will also reduce the likelihood of a successful cyber and physical attack, avoiding possibly harmful consequences.

The Grid Transformation Plan will also improve the customer experience. Customers will be able to select from an expanded set of digital communication channels. The digital communication channels will enable secure, streamlined, and convenient interactions between the customers and the Company. The new channels will also simplify transactions such as bill payment, rate and program selections, and program enrollment and de-enrollment. The GT Plan will also enable the Company to offer customers new scalable rate structures, expanded self-service options, and more customer-centric programs.

The GT Plan will reduce components of cost of service. Operational benefits include items such as field labor savings, reduction in number of events that require response, and better management of energy diversion.

Beyond these primary benefits, the GT Plan will likely lead to other societal benefits, such as reduced emissions, job creation, and economic development.

Other witnesses will provide greater detail on benefits of the various components of the GT Plan.

Q. Does the Company intend to establish performance metrics to track the success of the GT Plan?

A. Yes. The Company has developed a list of possible performance metrics, which the other witnesses in this case will discuss. The Company intends to work with Staff and other parties to refine this list and determine the ultimate performance metrics that the Company will use to track the GT Plan's success.

Q. What is the proposed level of investment associated with the Grid Transformation Plan?

A. The forecasted total proposed investment estimate associated with Phase I of the Grid Transformation Plan is approximately $816.3 million in capital investment and approximately $101.5 million in O&M investment. The forecasted total proposed investment estimate associated with the ten-year GT Plan is approximately $3,082.4 million in capital investment and approximately $429.0 million in O&M investment. My Schedule 2 provides a breakdown of projected cost by component of the GT Plan for Phase I and for the ten-year Plan. The other witnesses will provide further detail on these costs, and will describe how the Company forecasted these numbers.

Q. Is the Company seeking approval in the Petition beyond the proposed Phase I investments?

A. No. Although the Company has included the forecasted ten-year total cost for the Grid Transformation Plan to provide context, the Petition seeks approval only of the first three years of the Plan. The Company will update the forecasted costs for the later years of the Plan and will address the prudency of such costs in future filings.

Q. Does Phase I of Grid Transformation Plan "include both measures to facilitate integration of distributed energy resources and measures to enhance physical electric distribution grid reliability and security" as required by Va. Code § 56-585.1 A 6?

A. Yes it does. The measures proposed during Phase I of the GT Plan will enhance the reliability and security of the electric distribution grid. The infrastructure the Company proposes to put in place will also facilitate the integration of distributed energy resources.

Q. Are the grid transformation projects associated with Phase I of the Grid Transformation Plan, and the projected costs associated therewith, reasonable and prudent?

A. Yes. The proposed investments are reasonable, prudent, and necessary to meet the needs of the Company's customers, both now and for many years to come.

Q. Please introduce the other Company witnesses in this proceeding.

A. The Company is presenting the following additional witnesses:

- Brett A. Crable, Director of New Technology and Energy Conservation, provides details on the Company's plan to deploy smart meters across its service territory. Company Witness Crable will also discuss the emerging technology projects included in the GT Plan, and will introduce the current emerging technologies that the Company will continue to monitor for possible inclusion in future GT Plan filings.

- Franklin M. Hinckle, Jr., Director of Customer Account Management, describes the customer information platform that the Company plans to deploy to transform the customer experience.

- Robert S. Wright, Jr., Director of Distribution Planning, Reliability and GIS Services, explains the grid hardening activities that the Company has planned during Phase I of the GT Plan, as well as the intelligent grid devices and related operations and automated control systems that the Company plans to deploy. Company Witness Wright also explains the proposed investment in enhanced physical security at certain substations.

- Joseph A. Walker, Director of IT Business Accounts, describes the development and proposed execution of new telecommunications infrastructure that will ensure secure, reliable, available, and robust communications between the field and the back office, enabling the functionality of the other components of the GT Plan.

- Finally, Mark A. Engels, Senior Enterprise Security Advisor, describes the cyber and physical security controls that the Company plans to deploy as part of the GT Plan. He also explains how the Company will create and operate an analytics center of excellence to leverage predictive analytics across departments.

Q. Does this conclude your pre-filed direct testimony?

A. Yes it does.

BACKGROUND AND QUALIFICATIONS OF EDWARD H. BAINE

Edward H. Baine is Senior Vice President – Distribution for the Power Delivery Group of Dominion Energy, Inc. ("Dominion Energy"). He is responsible for all facets of Dominion Energy's regulated electric distribution business that provides electricity to about 2.6 million customer accounts in Virginia and northeastern North Carolina.

Mr. Baine joined Dominion Energy in 1995 as an associate engineer and has held numerous engineering, operational, and management positions within the Company. In 2006, he was named Director – Electric Distribution Operations Centers. He was promoted to Vice President – Shared Services, effective July 1, 2009, and was named Vice President – Fossil & Hydro Merchant Operations in January 2012. He was named Vice President – Power Generation System Operations in July 2013 and Senior Vice President – Transmission & Customer Service in June 2015. He assumed his current post in February 2016.

Mr. Baine is a member of the boards of directors of the Dominion Energy Credit Union; Chamber RVA, Venture Richmond, and the Capital Region Collaborative. He is also a member of the Board of Visitors of Virginia Tech. Mr. Baine also serves on the board of the Chesterfield Public Education Foundation and is a member of the Executive Advisory Council of the Robins School of Business at the University of Richmond. In addition, Mr. Baine serves on the boards of directors of SEE, the Virginia Tech Athletic Fund, MEGA Mentors, the American Association of Blacks in Energy, and the Valentine Museum, as well as the EEI National Response and AEIC Power Delivery executive committees.

Mr. Baine earned his bachelor's degree in electrical engineering from Virginia Tech and completed the advanced management program at Duke University's Fuqua School of Business. He is a registered professional engineer in Virginia.

Company Exhibit No. ___, EHB
Schedule 1
Selected Quantifiable Projected Benefits*

Data: Forecasted	$ in Millions
Description	20 Yr. Total
Smart Meters - Reduced Cost of Service	
Reduction of Field Metering Expenses from AMI	$256.5
Better Management of Energy Diversion from AMI Data	$99.5
Reduction of Bad Debt from Automated Work Orders through AMI	$85.1
SELECTED QUANTIFIABLE SMART METERS BENEFITS	**$441.1**
Reliability and Resiliency - Operational Efficiencies	
Reduction in OT, contract labor, and other efficiencies through hardening and analysis	$146.9
Reliability and Resiliency - Increase Reliability	
Reduced Outages - ICE Methodology - Better SAIDI	$2029.5
SELECTED QUANTIFIABLE RELIABILITY AND RESILIENCY BENEFITS	**$2176.3**
Telecommunications Infrastructure	
Total Reduction in O&M from Reduction or Avoided Leased Service Costs	$120.0
SELECTED QUANTIFIABLE TELECOMMUNICATIONS INFRASTRUCTURE BENEFITS	**$120.0**

*** Excludes non-quantifiable, qualitative, and other societal benefits.**

Company Exhibit No.___, EHB
Schedule 2
Projected Capital and O&M Investment

Data: Forecasted

$ in Millions

Description	2019 Capital	2019 O&M	2020 Capital	2020 O&M	2021 Capital	2021 O&M	Total 3 Years Capital	Total 3 Years O&M	Total 10 Years Capital	Total 10 Years O&M
Smart Meters Deployment	$60.4	$6.2	$129.3	$11.1	$124.2	$10.3	$314.0	$27.6	$478.0	$70.6
SMART METERS - TOTAL	$60.4	$6.2	$129.3	$11.1	$124.2	$10.3	$314.0	$27.6	$478.0	$70.6
Customer Information Platform										
CIP Implementation Cost	$5.1	$5.1	$36.2	$5.6	$41.2	$14.6	$82.5	$25.3	$185.0	$129.3
CUSTOMER INFORMATION PLATFORM - TOTAL	$5.1	$5.1	$36.2	$5.6	$41.2	$14.6	$82.5	$25.3	$185.0	$129.3
Reliability and Resiliency										
Intelligent Grid Devices Deployment Cost	$6.9	$.0	$19.9	$.1	$26.7	$.5	$53.6	$.6	$305.6	$33.9
Operations and Control Systems	$13.1	$1.8	$9.8	$2.2	$4.8	$3.0	$27.7	$6.9	$51.7	$41.7
Grid Hardening	$29.3	$11.2	$69.7	$12.2	$132.8	$12.4	$231.9	$35.8	$1,525.6	$71.3
RELIABILITY AND RESILIENCY - TOTAL	$49.4	$13.0	$99.4	$14.5	$164.3	$15.8	$313.1	$43.4	$1,883.0	$146.9
Telecommunications Infrastructure	$6.6	$1.2	$13.6	$.1	$49.7	$.6	$69.9	$1.9	$442.7	$60.1
TELECOMMUNICATIONS INFRASTRUCTURE - TOTAL	$6.6	$1.2	$13.6	$.1	$49.7	$.6	$69.9	$1.9	$442.7	$60.1
IT OT Security										
Cyber Security Implementation Costs	$2.2	$.1	$3.2	$.7	$3.5	$.8	$8.9	$1.6	$13.3	$7.3
Substation Physical Security Enhancement Cost	$3.6	$.1	$3.8	$.3	$.5	$.5	$7.9	$.9	$27.0	$8.3
IT OT SECURITY - TOTAL	$5.8	$.2	$7.1	$1.0	$4.0	$1.3	$16.8	$2.5	$40.3	$15.6
Predictive Analytics	$1.9	$.1	$3.8	$.2	$7.2	$.5	$12.9	$.8	$25.3	$6.0
PREDICTIVE ANALYTICS - TOTAL	$1.9	$.1	$3.8	$.2	$7.2	$.5	$12.9	$.8	$25.3	$6.0
Emerging Technology										
Smart Lighting NIC Card Deployment Costs	$2.4	$.0	$2.4	$.0	$2.4	$.0	$7.1	$.0	$28.0	$.0
Net-Metering Application Streamlining Cost	$.1	$.0	$.0	$.1	$.0	$.1	$.1	$.1	$.1	$.5
EMERGING TECHNOLOGY - TOTAL	$2.5	$.0	$2.4	$.1	$2.4	$.1	$7.2	$.1	$28.1	$.5
OVERALL TOTAL COST	$131.6	$25.7	$291.8	$32.7	$392.9	$43.1	$816.3	$101.5	$3082.4	$429.0

Pending required approvals