DIRECT TESTIMONY
OF
PHILLIP POWELL
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE -2007______

Q. Please state your name and position with Virginia Electric and Power Company ("Dominion Virginia Power" or "Company").

A. My name is Phillip Powell, and I am Director Electric Delivery Customer Growth in the Distribution Planning Department of Dominion Virginia Power located at 701 E. Cary Street in Richmond, Virginia.

Q. What is your educational and professional background?

A. I am a 1975 graduate of the Georgia Institute of Technology with a Bachelor of Science Degree in Electrical Engineering and a 1980 graduate of Purdue University with a Master of Science Degree in Electrical Engineering. I am a Registered Professional Engineer in the Commonwealth of Virginia since 1979. I am a Senior Member of the Institute of Electrical and Electronic Engineers, a member of the Power Engineering Society and a member of the Industrial Applications Society. I have over 30 years of experience in planning, operations and engineering of electric power systems. I have had various assignments with Dominion Virginia Power in three primary areas: System Protection, Power Supply and System Planning. The system protection work (16 years) involved design, setting and operation analysis of relay systems for the electrical network. The power supply work (4 years) involved system analysis of peak load flow data and transmission grid voltage performance. The system planning work involved developing the transmission expansion plan for the network (5 years) and developing the distribution expansion plan for the delivery system (5 years).

Q. What are your responsibilities?

A. I have the responsibility for directing Dominion Virginia Power's long range planning for distribution substations, distribution circuits and distribution right-of-ways required for electrical customer demand growth.

Q. What is the purpose of your direct testimony?

A. I will describe how, by using a "bottoms up" approach based on the Company's projected load additions at the individual circuit and transformer level, the Company validates the load forecasts produced for the Company by PJM. I also will describe how the PJM forecast is distributed by the Company among its 15 geographic load zones and four geographic load regions. Finally, I will discuss actual and projected load growth in the Company's service area, and in northern Virginia in particular, and will sponsor Appendix Attachment I.B.3 and portions of Appendix Section I.A.

Q. Describe the process of forecasting distribution circuit loads.

A. Dominion Virginia Power connects its distribution customer loading to its transmission network through its individual substation transformers. Dominion Virginia Power connects customer loading to its transmission-to-distribution substation transformers through 1,373 electrical distribution circuits. Each transformer supplies one or more distribution circuits. Each customer connection or "meter" is attached to a geographic customer location on a distribution circuit, and the usage is monitored monthly. At the times of winter and summer system peaks the total customer loads are recorded at the substation distribution circuit connection through the substation transformer supplying the circuits. Using this information Dominion Virginia Power models the individual distribution circuits and determines the customer by customer contribution to the circuit peak load.

Dominion Virginia Power then takes the model of the present peak loading on each circuit and develops a future model of the circuit growth. The first step is to normalize the loads to a 20-year temperature peak. The nearest weather monitoring station to the circuit is used to obtain the ambient temperature at the time of the peak. The loads for the circuit are adjusted to match the peak day ambient loading to the 20-year average peak temperature loading for the circuit. This normalized circuit model is completed for the existing peak and three previous peaks for summer and winter peak loading days.

The three normalized circuit peaks are trended forward based on linear regression and adjusted for the known residential, commercial and industrial growth planned along the geographic area the circuit supplies. As existing circuit and substation capacity is exhausted additional circuits and substations are planned to meet forecasted customer connect requirements. Using this method a detailed customer-based 10-year load forecast is completed for each circuit.

Each substation transformer load is then calculated by adding the loads forecasted for all of the circuits connected to the transformer. These loads are checked against the measured transformer loads at the substation. All transformers for a given geographic substation location are added to produce the total connected transmission load at this location.

Q. How are the transformer loads developed into loads at the transmission zone and region level?

A. For transmission planning purposes, the Company divides its transmission loads into 15 geographic load sub-regions, or zones, which, in turn, are collected into four geographic load regions. The Central Region is made up of the Richmond, Chesterfield, Southside and Northern Neck sub-regional zones. The East and North Carolina Region is comprised of the Yorktown, Virginia Beach, Suffolk, Carolina and Outer Banks sub-regional zones. The Gordonsville, Valley and Lexington zones make up the West Region. The Alexandria/Arlington, Fairfax and Woodbridge sub-regional zones are combined into the North Region.

Each substation is located in one of the 15 transmission sub-regional zones, and each zone's load is the summation of all of the transformers in that zone. The load for each region is the total loads of all of the zones in that region.

Q. How are the customer-based circuit loads used in the Company's planning process?

A. PJM Interconnection, L.L.C. ("PJM") forecasts Dominion Virginia Power's Summer and Winter Peak demand load. Dominion Virginia Power takes the PJM aggregate forecast and shares it to the 15 transmission sub-regional zones. A set of transmission zone-level peak forecasts are calculated from the aggregate PJM forecast. Each aggregate sub-regional zone load forecast is shared to the geographic substation locations using the customer-based substation and circuit forecast. Dominion Virginia Power uses the weather-normalized 5-year average annual growth rates to determine the growth trends for the region zones. Each of the geographic substation loads calculated from the PJM aggregate forecast is compared to the geographic substation loads calculated from the customer-based circuit load growth forecast to validate accuracy. Any differences in the forecasts are resolved and the information supplied back to the Company's transmission planning model, which is used by the Company for its own planning studies and supplied to PJM for use in the regional planning process.

Dominion Virginia Power commissioned Itron, Inc. ("Itron") to determine whether the Company's allocation methodology is reasonable. Itron developed a series of competing models for performing this function and the resulting zonal peak forecasts were compared in the Itron Report attached to Mr. Frank Monforte's direct testimony. The analysis demonstrates that Dominion Virginia Power's allocation framework provides reasonable projections of the regional peaks.

Q. Please discuss the growth in the demand for electric service in your service area.

A. The demand for electric service has grown rapidly over the last five years in Dominion Virginia Power's service area. During this time, the Company's total electrical demand has grown by 2,387 MW, with 969 MW (40.6%) of this increase occurring in northern Virginia. On August 3, 2006, Dominion Virginia Power's customers set a new system peak electrical demand of 19,375 MW, of which the northern Virginia portion of this load was approximately 6,368 MW.

<u>Attachment I.B.3</u> to the Appendix provides summer (peak) load growth in northern Virginia versus the entire Dominion Virginia Power system on an actual basis and on a projected basis using the 2006 PJM forecast and on a projected basis using the revised 2007 PJM forecast. The projected loads represent Dominion Virginia Power's forecasted

peaks and demonstrate the significant growth currently being experienced now and expected in the future. Between 1996 and 2001 the annual increase in Dominion Virginia Power's weather-normalized peak was 411 MW. Between 2001 and 2006 the annual weather-normalized peak accelerated to 471 MW as a result of increased economic growth. According to PJM's 2007 load forecast, Dominion Virginia Power's weather-normalized peak will grow at an annual rate of 296 MW from 2006 to 2011. Between 1996 and 2001, the annual increase in northern Virginia's weather-normalized peak was 144 MW. Between 2001 and 2006, northern Virginia's annual weather-normalized peak accelerated to 207 MW as a result of increased economic growth. The PJM forecast shared to northern Virginia produces an annual weather-normalized increase in peak load of 131 MW from 2006 to 2011. The Company's substation and circuit-based forecast for northern Virginia produces an annual weather-normalized increase in peak load of 244 MW from 2006 to 2011. Dominion Virginia Power's actual substation and circuit-based loads for northern Virginia continued to show accelerating growth trends from 1996 through 2006. The substation and circuit-based forecast for northern Virginia continues to show an increase in growth trends from 2006 to 2011.

Q. What conclusion do you draw from these results?

A. The PJM forecast does not overstate the projected load increases in the next five years for the Company's system, and northern Virginia in particular, and may be somewhat conservative. The difference in these annual weather-normalized peaks could result from the fact that the PJM forecast for the Company's control area uses a combination of the Gross Metropolitan Product ("GMP") data for the Richmond, Virginia Beach and Roanoke areas. Such data for the Washington, D.C. area is not included, which could result in understatement of the northern Virginia loads. The Company has requested the PJM Capacity Adequacy Planning Department, which is responsible for the PJM long-term load forecast, to consider including the Washington, D.C. area data, and the matter is under PJM review.

Q. What has driven this growth in northern Virginia?

A. This area of the state has experienced explosive growth in population and electrical demand over the last six years. The population growth in northern Virginia, as compared to the state as a whole, is shown below (source: Weldon Cooper Center 2000 -2006).

Culpeper County	29.0%
Fauquier County	17.2%
Loudoun County	59.0%
Prince William County	31.5%
Northern Virginia	15.3%
Virginia	8.0%

The electrical demand in northern Virginia has increased by 35.8% during this same time period, more than double the area's rate of population growth. There are primarily two components to residential demand: the increase in the number of consumers using electricity and the increase in the amount of electricity each consumer uses. Naturally as the population increases, the demand for electricity increases as well. Also, consumers are adding more equipment that uses electricity, thereby increasing the amount that each consumer uses.

The commercial growth in northern Virginia is driven by its proximity to Washington, D.C. and the high technology industries that locate in this region. One of the major technology industries now locating in this region is data centers. Their attraction to northern Virginia is due to the access to existing fiber networks and lower than average electrical rates that exist in the Commonwealth as compared to national averages. Data centers have extremely high electrical usage. Many of their facilities are of similar size to a department store; however, their electrical demand can be equivalent to or greater than 6,000 homes. These high technology customers are not only building in traditional northern Virginia, but also in places such as Culpeper County where the recently announced Terremark World, Inc. has indicated plans to build a data center campus. Additionally, there are 23 known and planned new data centers on the drawing board for northern Virginia by 2012. Other future development activities that will affect electricity usage include the realignment of Fort Belvoir, continued capital improvements at Washington Dulles International Airport and the redevelopment in the Tysons Corner area resulting from the metro extension through Tysons Corner to Dulles Airport.

Q. **Does this complete your prepared direct testimony?**

A. Yes, it does.