

COMMONWEALTH OF VIRGINIA
BEFORE THE
STATE CORPORATION COMMISSION

APPLICATION OF)
)
TRANS-ALLEGHENY INTERSTATE LINE)
COMPANY) Case No. PUE-2007-000____
)
For approval and certification of electric)
transmission facilities under Va. Code)
§ 56-46.1 and the Utility Facilities Act,)
Va. Code § 56-265.1 *et seq.*)

APPLICATION OF
TRANS-ALLEGHENY INTERSTATE LINE COMPANY
FOR APPROVAL AND CERTIFICATION OF ELECTRIC FACILITIES FOR
THE
CONSTRUCTION OF 500 kV TRANSMISSION LINE

DIRECT TESTIMONY OF
SCOTT W. GASS

April 19, 2007

1 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

2 A. My name is Scott W. Gass and my business address is 15 Shannon Way,
3 Royersford, Pennsylvania 19468.

4 Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

5 A. I am employed by PowerGEM as a Principal Consultant.

6 Q. PLEASE DESCRIBE POWERGEM.

7 A. PowerGEM was founded in May 2000 to provide expert advice, analysis, and
8 software addressing the economic and technical impacts of transmission congestion
9 in competitive electricity markets.

10 Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND
11 PROFESSIONAL EXPERIENCE.

12 A. I graduated from Pennsylvania State University in 1987 with a Bachelor of Science
13 in Electric Engineering. In addition, I completed a two-year power system
14 operations and planning course provided by Power Technologies, Inc. in 1989.

15 Upon graduation from Pennsylvania State University, I joined GPU Energy
16 in June 1987. At GPU Energy, I was involved in transmission, sub-transmission
17 and distribution planning where I analyzed current and future infrastructure to
18 optimize system utilization and to ensure adequate and reliable service to
19 customers. I also completed operating studies to provide dispatchers with expected
20 problem areas and solutions. As a direct result of my work, I have extensive
21 experience with regard to Mid-Atlantic Area Council reliability criteria, transient
22 analysis, load flow and short circuit analysis.

1 In October 1998, I joined PJM Interconnection, L.L.C. (“PJM”) as a Senior
2 Engineer in Transmission Planning with responsibility for coordinating all
3 generation interconnection and baseline studies, including completion of over one
4 hundred interconnection load flow and short circuit studies. In July 2003, I was
5 promoted to Manager Transmission Planning. In that position, I was responsible
6 for all aspects of the planning analysis conducted by PJM on its transmission
7 system, including the interconnection of new generation to the PJM transmission
8 system; working with transmission owners to develop system enhancements to
9 maintain future reliability of the PJM system; the integration of Allegheny Power,
10 Commonwealth Edison Company, American Electric Power Company, Dayton
11 Power & Light Company, Virginia Electric and Power Company (“Dominion
12 Virginia Power”) and Duquesne Light Company into PJM; and managing and
13 mentoring 18 transmission planning engineers.

14 While at PJM, I represented PJM on numerous stakeholder committees,
15 including the Regional Planning Process Working Group, the Reliability Planning
16 Criteria Working Group, the Planning Committee, the Economic Planning
17 Implementation Working Group, the Transmission Expansion Advisory Committee
18 and two Inter-Regional Planning Stakeholder Committee efforts, one with the
19 Independent System Operator of New England (“ISO-NE”)and New York
20 Independent System Operator and the other with the Midwest Independent
21 Transmission System Operator. In addition, I was involved in the development and
22 implementation of multiple standards and procedures followed by PJM, including

1 among others the generation and merchant transmission interconnection processes,
2 the generation and load deliverability procedures, PJM Planning Criteria, and cost
3 allocation procedures for both baseline and network upgrades for interconnection
4 projects. I was also responsible for completing the studies associated with the
5 extension of the PJM planning horizon in 2006 from five years to 15 years.

6 In November 2006, I joined PowerGEM as a Principal Consultant. My
7 work responsibilities have included completion of fatal flaw studies for potential
8 generation interconnection projects and the development of a Minimum
9 Interconnection Standard test and procedure for application in the recently
10 approved ISO-NE Forward Capacity Market.

11 Q. PLEASE DESCRIBE THE PURPOSE OF YOUR TESTIMONY.

12 A. I am testifying on behalf of TrAILCo to demonstrate the electrical need for the
13 Virginia Segments of the Trans-Allegheny Interstate Line (“TrAIL”). TrAILCo
14 witnesses Hozempa and Herling are also providing testimony relating to the
15 electrical need for these transmission line segments and the planning process that
16 resulted in the determination of that need.

17 Q. WILL THE USE OF VARIOUS TERMS IN YOUR TESTIMONY BE
18 CONSISTENT WITH THE DEFINITIONS ASSIGNED TO THOSE
19 TERMS IN THE TABLE OF NOMENCLATURE ATTACHED TO THE
20 APPLICATION AS EXHIBIT 2?

21 A. Yes. In addition, I may define other specific terms in my direct testimony.

1 Q. PLEASE IDENTIFY THE EXHIBITS TO YOUR TESTIMONY.

2 A. I am sponsoring three exhibits with my direct testimony:

- 3 • Exhibit SWG-1 presents the electric reliability problems that will occur
4 if the Virginia Segments are not constructed;
- 5 • Exhibit SWG-2 presents the 2006 through 2015 projected summer peak
6 loads for the mid-Atlantic and northern Virginia areas; and
- 7 • Exhibit SWG-3 presents the mid-Atlantic area and northern Virginia
8 area historical summer peak loads for 1995 through 2005.

9 Q. DID YOU HAVE A ROLE IN DETERMINING THE ELECTRICAL NEED FOR
10 THE VIRGINIA SEGMENTS WHILE WORKING FOR PJM?

11 A. Yes. In my role as PJM's Manager of Transmission Planning, I supervised the
12 creation of the base case for the 2011 Regional Transmission Expansion Plan
13 ("RTEP") and the power system studies that determined the need for the 502
14 Junction Substation, the 502 Junction Segments, the Mt. Storm Expansion, the
15 Meadow Brook Expansion, the Loudoun Segment and the Loudoun Expansion. The
16 Virginia Segments are the portions that TrAILCo proposes to construct in Virginia.
17 The need for the Virginia Segments generally is the same as the need for the 502
18 Junction Substation, the 502 Junction Segments, the Mt. Storm Expansion, the
19 Meadow Brook Expansion, the Loudoun Segment and the Loudoun Expansion.

20 Q. WHAT STUDIES DID YOU PERFORM OR SUPERVISE THE PERFORMANCE
21 OF AS MANAGER TRANSMISSION PLANNING THAT DETERMINED THE
22 NEED FOR THE VIRGINIA SEGMENTS?

1 A. I supervised all of the analyses conducted with the 2011 RTEP case, including
2 model adjustments, identifying reliability criteria violations, and formulating
3 solutions to the violations. Specifically with regard to the electrical need for the
4 502 Junction Substation, the 502 Junction Segments, the Mt. Storm Expansion, the
5 Meadow Brook Expansion, the Loudoun Segment and the Loudoun Expansion, I
6 supervised the generator deliverability, load deliverability and NERC Category C
7 studies.

8 Q. WHAT ROLE DID ALLEGHENY POWER HAVE WITH REGARD TO THESE
9 STUDIES?

10 A. Allegheny Power provided the electrical model data for the Allegheny Power
11 transmission zone of PJM (“Allegheny Power Zone”) and the contingency files
12 used in the analyses. In addition, Allegheny Power reviewed the model once it
13 was created by PJM. Allegheny Power worked closely with my staff at PJM in
14 validating reliability criteria violations and formulating the 502 Junction
15 Substation, the 502 Junction Segments, the Mt. Storm Expansion, the Meadow
16 Brook Expansion, the Loudoun Segment and the Loudoun Expansion as the
17 overall solution to the identified violations.

18 Q. WHAT CONCLUSIONS WERE REACHED AS A RESULT OF THOSE
19 STUDIES?

20 A. Based on the studies performed by PJM, Dominion Virginia Power and Allegheny
21 Power, PJM concluded that there are 11 electric reliability problems that will occur

1 beginning in summer 2011 and one electric reliability problem that will occur
2 beginning in summer 2014 if the project is not constructed.

3 Q. WHAT ARE THOSE ELECTRIC RELIABILITY PROBLEMS?

4 A. The problems are identified on Chart A attached to my testimony as Exhibit SWG-
5 1. In the same exhibit, Chart B identifies the current ownership of facilities
6 referred to in Chart A.

7 Q. PLEASE EXPLAIN CHART A.

8 A. The left column identifies possible electric occurrences or “contingencies” and the
9 right column identifies the electrical result of the occurrence if the occurrence
10 occurs any time after June 2011 for occurrences 1 through 8 and 10 through 12,
11 and after June 2014 for occurrence 9. Using #1 as an example, if there is an outage
12 on Line #572A (e.g. unscheduled due to a storm or equipment malfunction, or
13 scheduled due to the need for maintenance), Line #512 (designated as Line #551
14 by Dominion Virginia Power) will be called upon to provide back-up transmission
15 capacity. However, due to the growing consumer loads served by these lines, it is
16 projected that by Summer 2011, Line #512 will not have enough capacity to
17 deliver all of the electricity needed by the consumers ordinarily served by the two
18 lines together. As a consequence, while Line #572A is not operational due to the
19 outage, Line #512 will overload. As another example using #10 on Chart A,
20 outages on Line #580 and Line #572B at the same time will cause the 138 kV
21 system voltage level around Meadow Brook Substation to drop below acceptable

1 voltage limits that are applied in the planning and operation of the PJM system,
2 which also could lead to a voltage collapse in the area.

3 Q. CHART A REFERS TO “EMERGENCY RATING,” “OVERLOADS” AND
4 “ACCEPTABLE LIMITS.” WHAT DO THESE TERMS MEAN?

5 A. “Acceptable limits” in the context of Chart A refers to the voltage limits that are
6 considered acceptable in the planning and operation of the PJM transmission
7 system. “Emergency rating” refers to the equipment loading limit that should not
8 be exceeded after the outage of other power system equipment. As an example,
9 the loading on Line A should not be above its emergency rating for the outage of
10 Line B. The term “overload” is used to describe the condition when the equipment
11 loading exceeds the applicable rating.

12 Q. PLEASE EXPLAIN THE CONCEPT OF “ELECTRIC RELIABILITY.”

13 A. “Electric reliability” or “reliability,” as used by industry experts, refers to the
14 delivery of electricity to customers in the amounts desired and within accepted
15 standards for the frequency, duration and magnitude of outages and other adverse
16 conditions or events. “Load pockets” are created when a major electric load center
17 (*i.e.* an area where there is a highly concentrated use of electricity) must import
18 much of its electricity via transmission lines from neighboring regions with
19 available generation. As a result, transmission lines delivering electricity into the
20 load pocket from external generating plants will often experience reliability
21 problems. In other words, these lines do not have the capacity to deliver to the load

1 pocket as much electricity as is needed to meet consumer demand and become
2 overloaded. Reliability problems occur when the lines become overloaded.

3 Q. HOW ARE RELIABILITY PROBLEMS AVOIDED?

4 A. New or upgraded transmission lines must be constructed before the reliability
5 problems occur. Alternatively, new generating plants can be constructed within the
6 load pocket, or consumers can reduce their demand. As indicated previously, it is
7 very difficult to build a new generating plant in an urban area. Because demand
8 reduction initiatives are largely voluntary, they cannot guarantee the mitigation of
9 the relevant reliability risks. Thus, even if demand reduction is being encouraged
10 and new generation is being explored, construction of new or upgraded
11 transmission lines is often essential to prevent identified reliability problems from
12 occurring while those alternatives are pursued and in case those alternatives do not
13 materialize in sufficient quantity to eliminate the reliability problem. However,
14 transmission planning is not a “one time” activity. Instead, it is dynamic and
15 involves ongoing review of changes in the transmission system that result from the
16 decommissioning of existing plants, the addition of new plants, changes in load
17 patterns and other events that affect the topology of the transmission system.

18 Q. HOW DO TRANSMISSION PLANNERS DETERMINE IF, AND WHEN,
19 RELIABILITY PROBLEMS WILL OCCUR IF CORRECTIVE ACTION ON
20 THE TRANSMISSION SYSTEM IS NOT TAKEN?

21 A. The North American Electric Reliability Corporation (“NERC”) has been
22 designated by the Federal Energy Regulatory Commission (“FERC”) as the

1 Electric Reliability Organization for the United States. Mandatory reliability
2 standards developed by NERC and approved by FERC are used by transmission
3 planners to measure the need for new transmission lines or upgrades to existing
4 lines. In addition, transmission owners and PJM have developed planning
5 reliability standards to supplement the NERC reliability standards. The FERC,
6 transmission owner and PJM planning reliability standards (collectively,
7 “Reliability Standards”) were the criteria used to determine that the Virginia
8 Segments, as part of the overall reliability solution, are needed to prevent these
9 electric reliability problems from occurring.

10 Q. HOW ARE THE RELIABILITY STANDARDS USED TO DETERMINE WHEN
11 NEW TRANSMISSION LINES OR UPGRADES TO EXISTING LINES ARE
12 NEEDED?

13 A. PJM, in conjunction with transmission owners such as Allegheny Power and
14 Dominion Virginia Power, conducts studies of the PJM transmission system that
15 apply the Reliability Standards to specific conditions on the transmission system.
16 When the studies show an inability of the transmission system to meet a specific
17 Reliability Standard under these conditions, construction of one or more new
18 transmission lines or one or more enhancements to existing transmission facilities
19 is necessary.

20 Q. WHAT TYPES OF STUDIES ARE USED TO DETERMINE IF
21 TRANSMISSION SYSTEM UPGRADES ARE NECESSARY?

1 One type of study is a Load Deliverability Study. This study examines defined
2 load zones within the PJM region and considers the ability of the transmission
3 system to deliver adequate power to the load zone during a generation capacity
4 emergency. A generation capacity emergency occurs when there is high load (*i.e.*,
5 high consumer demand) on the electric system and insufficient generation capacity
6 within the load zone. PJM uses its “Load Deliverability Procedure” to conduct
7 such a Load Deliverability study.

8 A Generation Deliverability Study is also conducted. This study tests the
9 system to assure that capacity resources can be delivered to the remainder of the
10 PJM system at peak load. PJM uses its “Generator Deliverability Procedure” to
11 conduct such a Generator Deliverability study.

12 Both types of studies are conducted by simulating the transmission system
13 as it is expected to exist during future time periods. The simulation includes
14 expected load growth (for the load deliverability test this includes the anticipated
15 benefits of demand side management and conservation activities), the addition of
16 new generating plants and the retirement of existing generation plants, and planned
17 transmission construction projects.

18 Q. WHAT TIME PERIOD WAS CONSIDERED FOR PURPOSES OF THE LOAD
19 DELIVERABILITY AND GENERATION DELIVERABILITY STUDIES
20 ASSOCIATED WITH THE VIRGINIA SEGMENTS?

1 A. The studies supporting the need for these line segments were based on a five-year
2 timeframe, thereby making it critical that the line comprised of these segments be
3 constructed and placed into service by June 2011.

4 Q. WHAT HAPPENS WHEN A TRANSMISSION LINE OVERLOADS OR
5 EXCEEDS ITS LOADING CAPABILITY?

6 A. When a transmission line overloads, the conductor, the conductor clamps, and the
7 line terminal equipment begin to overheat. Overheating the conductor may cause
8 the line to sag low enough to bring the line into contact with whatever is
9 underneath it. Under these conditions, the metal in the conductor may become
10 brittle, rendering the line useless. In addition, the line may break and fall to the
11 ground. Overheating of the conductor clamps and line terminal equipment may
12 cause similar results. In short, overloading transmission lines may cause permanent
13 damage to transmission infrastructure and catastrophic power outages.

14 Q. WHAT ACTION IS REQUIRED TO PREVENT THESE RESULTS?

15 A. To prevent the consequences of a potential transmission line overload, immediate
16 action must be taken by system operators before the line or related equipment fails
17 or is permanently damaged. The action may include turning specific generating
18 plants off or on, opening or closing specific transmission lines, or discontinuing
19 electric service to certain customers or groups of customers in specific areas.
20 However, these are emergency and temporary measures only. They prevent a
21 specific breakdown on that occasion, but do not solve the underlying problem. On

1 a long-term basis, construction of one or more new transmission lines or one or
2 more enhancements to existing transmission lines is necessary.

3 Q. WHAT HAPPENS WHEN THE VOLTAGE DROPS AT A SUBSTATION?

4 A. The severity of the consequences depends on the severity of the voltage drop at the
5 substation. Voltage drops can occur when large loads are turned on and when
6 faults or short circuits occur on the system. Voltage drops of less than 3% are
7 usually not significant. However, when the voltage drop at a substation exceeds
8 3%, the consequences can range from annoying dimming of lights in homes and
9 businesses to a voltage collapse.

10 Q. WHAT HAPPENS WHEN THERE IS A VOLTAGE COLLAPSE ON THE
11 TRANSMISSION SYSTEM?

12 A. A voltage collapse occurs when the voltage on the system drops to a critically low
13 level and the system is unable to support power transfers across the system and
14 customers' load connected to the system. This condition usually results in a
15 blackout or a brownout. The area affected could be a single community or several
16 communities, or the blackout or brownout could be much more widespread and
17 encompass an entire region.

18 Q. CAN THE RELIABILITY PROBLEMS DESCRIBED HEREIN RESULT IN A
19 BLACKOUT LIKE THE ONE EXPERIENCED IN A LARGE PART OF THE
20 EASTERN UNITED STATES AND EASTERN CANADA IN AUGUST 2003?

21 A. Yes, that is possible. Just before that massive blackout occurred, several
22 transmission lines began to overload due to system conditions. As the overloaded

1 transmission lines were disconnected from the grid, voltage on parts of the
2 transmission system in the eastern United States and eastern Canada began to
3 collapse, causing generating plants to automatically shut down and additional
4 transmission lines to overload and subsequently disconnect from the grid. This
5 process, often called “cascading,” continued until over 50 million people from the
6 east coast to Ohio and north into Canada were without power.

7 Q. ARE THE VIRGINIA SEGMENTS, AS PART OF THE OVERALL
8 RELIABILITY SOLUTION YOU HAVE DESCRIBED, NECESSARY TO HELP
9 AVOID THIS TYPE OF BLACKOUT FROM OCCURRING AGAIN?

10 A. Yes. The Virginia Segments, along with the 502 Junction Substation, the 502
11 Junction Segments, the West Virginia Segments, the Mt. Storm Expansion, the
12 Meadow Brook Expansion, the Loudoun Segment and the Loudoun Expansion,
13 will significantly enhance the electric reliability of a major portion of the eastern
14 United States, particularly the area from northern Virginia to northern New Jersey.

15 Q. PLEASE IDENTIFY AND DESCRIBE THE RELIABILITY STANDARDS
16 THAT WILL BE VIOLATED BY EACH OF THE RELIABILITY PROBLEMS
17 IDENTIFIED IN CHART A IF THE VIRGINIA SEGMENTS ALONG WITH 502
18 JUNCTION SUBSTATION, THE 502 JUNCTION SEGMENTS, THE WEST
19 VIRGINIA SEGMENTS, THE MT. STORM EXPANSION, THE MEADOW
20 BROOK EXPANSION, THE LOUDOUN SEGMENT AND THE LOUDOUN
21 EXPANSION ARE NOT CONSTRUCTED.

1 A. Electrical occurrences 1 through 9 are violations of NERC Reliability Standard
2 TPL-002-0. This is the standard that states the bulk electric system must be able to
3 meet customer demands and be able to maintain firm transmission with the loss of
4 a single bulk electric system element. Electrical occurrences 1 through 3 also are
5 violations of the PJM Generator and Load Deliverability Procedure while electrical
6 occurrence 4 is a violation of the PJM Load Deliverability Procedure and electrical
7 occurrence 9 is a violation of the PJM Generator Deliverability Procedure.
8 Electrical occurrences 5 through 8 are violations of Dominion Virginia Power's
9 planning criteria. Electrical occurrences 10 through 12 are violations of NERC
10 Reliability Standard TPL-003-0, which is the loss of two or more bulk electric
11 system elements. This standard requires the bulk electric system to meet customer
12 demand under these conditions without cascading outages; however, controlled
13 load loss or reduction of transfers is permitted.

14 If the Virginia and West Virginia Segments, along with 502 Junction
15 Substation, the remainder of the 502 Junction Segments, the Mt. Storm Expansion,
16 the Meadow Brook Expansion, the Loudoun Segment and the Loudoun Expansion
17 are not constructed, PJM as the regional planning authority, Allegheny Power and
18 Dominion Virginia Power will be in violation of these Reliability Standards.

19 Q. DID THESE STUDIES IDENTIFY ANY LOAD ZONES AFFECTED BY THESE
20 RELIABILITY PROBLEMS?

21 A. Yes. The studies indicate that the loads (i.e. consumer demand) in the mid-Atlantic
22 and northern Virginia areas within the PJM region will reach a high enough level

1 by 2011 that electric reliability to these areas will be significantly jeopardized if
2 these facilities are not constructed. For study purposes, the mid-Atlantic area
3 consists of the area along the Atlantic seaboard from the District of Columbia to
4 Northern New Jersey and includes the metropolitan areas of Washington,
5 Baltimore, Philadelphia and Newark. The northern Virginia area includes the
6 service territories of both Allegheny Power and Dominion Virginia Power. The
7 mid-Atlantic and northern Virginia areas were identified by the U.S. Department of
8 Energy in its *National Electric Transmission Congestion Study* issued in August
9 2006 as parts of a “Critical Congestion Area” and in need of immediate attention
10 through the construction of new transmission facilities. The West Virginia
11 Segments, along with the 502 Junction Substation, the remainder of the 502
12 Junction Segments, the Mt. Storm Expansion, the Meadow Brook Expansion, the
13 Loudoun Segment and the Loudoun Expansion, have been identified by PJM as the
14 most viable solution to this problem.

15 Q. DO YOU HAVE ANY EXHIBITS THAT DEMONSTRATE THIS LOAD
16 GROWTH?

17 A. Yes. Exhibit SWG-2 shows the 2006 through 2015 projected summer peak loads
18 for the mid-Atlantic and northern Virginia areas based on the 2006 PJM load
19 forecast. The mid-Atlantic area 2011 peak summer load is 63,777 megawatts
20 (“MW”). The northern Virginia area 2011 peak summer load for the Dominion
21 Virginia Power zone is 6,532 MW and the northern Virginia area 2011 peak
22 summer load for the Allegheny Power Zone is 693 MW. These load forecasts

1 formed the basis of the load models that were applied to the RTEP 2011 power
2 system studies that identified the need for the West Virginia Segments, the 502
3 Junction Substation, the remaining 502 Junction Segments, the Mt. Storm
4 Expansion, the Meadow Brook Expansion, the Loudoun Segment and the Loudoun
5 Expansion.

6 Q. PLEASE IDENTIFY THE MAJOR UTILITIES IN THE MID-ATLANTIC AND
7 NORTHERN VIRGINIA AREAS THAT PROVIDE ELECTRIC SERVICE TO
8 CUSTOMERS IN THOSE AREAS.

9 A. The major utility service areas constituting the mid-Atlantic area for the purposes
10 of my direct testimony are Rockland Electric Company; Public Service Electric &
11 Gas Company; Jersey Central Power & Light Company; Atlantic City Electric
12 Company; Delmarva Power & Light Company; PECO Energy Company; PPL
13 Energy Plus, LLC; Metropolitan Edison Company; Pennsylvania Electric
14 Company; Baltimore Gas and Electric Company; Potomac Electric Power
15 Company and UGI Utilities. The major utilities in the northern Virginia area are
16 Dominion Virginia Power and Allegheny Power. The Dominion Virginia Power
17 service territory in northern Virginia consists of Arlington, Fairfax, Fauquier,
18 Loudoun, Prince William, Spotsylvania and Stafford Counties and the cities of
19 Alexandria, Falls Church, Vienna, Fairfax, Leesburg, Manassas and Warrenton.
20 The Allegheny Power service territory in northern Virginia includes Clarke,
21 Fauquier, Frederick, Greene, Madison, Page, Rappahannock, Shenandoah and
22 Warren Counties.

1 Q. WHAT IS THE PRIMARY FACTOR CAUSING THE ELECTRICAL NEED
2 FOR THE WEST VIRGINIA SEGMENTS, THE 502 JUNCTION SUBSTATION,
3 THE REMAINDER OF THE 502 JUNCTION SEGMENTS, THE MT. STORM
4 EXPANSION, THE MEADOW BROOK EXPANSION, AND THE VIRGINIA
5 SEGMENTS, INCLUDING THE LOUDOUN SEGMENT AND THE LOUDOUN
6 EXPANSION?

7 A. Consumer demand in the mid-Atlantic and northern Virginia areas is the main
8 factor causing the electrical need for these facilities. There are primarily two
9 components to consumer demand, the increase in the number of consumers using
10 electricity and the increase in the amount of electricity each consumer uses.
11 Naturally as the population increases, the demand for electricity increases as well.
12 Also, consumers are adding more equipment that uses electricity, thereby
13 increasing the amount that each consumer uses.

14 Q. HOW HAS CONSUMER DEMAND IN THE MID-ATLANTIC AND
15 NORTHERN VIRGINIA AREAS INCREASED DURING THE PAST TEN
16 YEARS?

17 A. Exhibit SWG-3 contains the mid-Atlantic area and northern Virginia area historical
18 summer peak loads for 1995 through 2005. During this period, the mid-Atlantic
19 area load grew by over 20% while the northern Virginia area load grew by over
20 40% in the Dominion Virginia Power service territory and over 60% in Allegheny
21 Power service territory.

1 Q. WHAT ARE PJM'S PROJECTIONS FOR CONSUMER DEMAND IN THE
2 MID-ATLANTIC AND NORTHERN VIRGINIA AREAS FOR THE FIVE-
3 YEAR PERIOD OF 2007 THROUGH 2011?

4 A. Exhibit SWG-2 shows the mid-Atlantic area and northern Virginia area projected
5 summer peak loads for 2006 through 2015. The annual projections for consumer
6 demand in the mid-Atlantic area for 2007 to 2011 are 59,611 MW; 60,965 MW;
7 61,966 MW; 62,850 MW; and 63,777 MW, respectively, for each of these five
8 years. These projections are based on the 2006 PJM Load Forecast Report that was
9 used as the basis for the load flow models that identified the need for the West
10 Virginia Segments, the 502 Junction Substation, the remainder of the 502 Junction
11 Segments, the Mt. Storm Expansion, the Meadow Brook Expansion, the Loudoun
12 Segment and the Loudoun Expansion. The annual projections for consumer
13 demand in Dominion Virginia Power portion of the northern Virginia area for 2007
14 through 2011 are 6,037 MW; 6,205 MW; 6,316 MW; 6,411 MW; and 6,532 MW,
15 respectively, for each of the five years. The annual projections for consumer
16 demand in the Allegheny Power portion of the northern Virginia area for 2007
17 through 2011 are 721 MW, 646 MW, 661 MW, 678 MW and 693 MW,
18 respectively, for each of the five years.

19 Q. HOW WILL ELECTRIC SERVICE CUSTOMERS WITHIN THE ALLEGHENY
20 POWER ZONE BE AFFECTED IF TRAIL IS NOT CONSTRUCTED?

21 A. The customers served by Allegheny Power in northern Virginia will be at risk for
22 Electrical Occurrences 1 through 8 and 10 through 12 listed in Chart A. The load

1 in the Allegheny Power Zone that is located to the east of the overloaded
2 transmission lines could be affected in one of two ways if these facilities are not
3 constructed by 2011. First, for any of Electrical Occurrences 1 through 8 listed in
4 Chart A, load may need to be disconnected in order to reduce the loading on the
5 Mt. Storm-Doubs 500 kV line, a major transmission line that originates at the Mt.
6 Storm Substation in Grant County, West Virginia and passes through Grant, Hardy
7 and Hampshire Counties in West Virginia before entering Virginia and then re-
8 entering West Virginia to pass through Berkeley County before entering Virginia
9 again and continuing to the Doubs Substation in Frederick County, Maryland. It is
10 likely that a portion of any disconnected load would be located in the Allegheny
11 Power Zone east of the overloaded facility since this load has a direct impact on the
12 overloaded facility. The Allegheny Power Zone also could be impacted due to the
13 low voltages or voltage collapse resulting from Electrical Occurrences 10 through
14 12 listed in Chart A.

15 Q. EARLIER IN YOUR TESTIMONY YOU STATED THAT THE WEST
16 VIRGINIA SEGMENTS, THE 502 JUNCTION SUBSTATION, THE
17 REMAINDER OF THE 502 JUNCTION SEGMENTS, THE MT. STORM
18 EXPANSION, THE MEADOW BROOK EXPANSION, THE LOUDOUN
19 SEGMENT AND THE LOUDOUN EXPANSION HAVE BEEN IDENTIFIED
20 AS THE MOST VIABLE SOLUTION TO RESOLVE THE POTENTIAL
21 RELIABILITY PROBLEMS YOU HAVE IDENTIFIED IN CHART A. PLEASE

1 EXPLAIN WHY THESE SEGMENTS ARE THE MOST VIABLE SOLUTION
2 TO RESOLVE THESE PROBLEMS.

3 A. PJM recommended the construction of these facilities collectively as the most
4 viable solution based on its review of all the alternatives considered. This solution
5 solves multiple reliability violations in a cost-effective manner and is completed
6 with the construction of one line at an estimated cost of \$850 million.

7 Q. WHAT SPECIFIC ELECTRICAL ALTERNATIVES DID PJM STUDY
8 AND/OR CONSIDER TO THE CONSTRUCTION OF THESE FACILITIES?

9 A. A second Mt. Storm-Doubs 500 kV line was considered as an alternative. This
10 alternative did not resolve the overload on the Pruntytown-Mt. Storm 500 kV line
11 (another critical major transmission line originating in Taylor County, West
12 Virginia and extending to the Mt. Storm Substation) and caused the overload to
13 advance from 2014 to 2011. A new Mt. Storm-Loudoun 500 kV line was
14 considered as another alternative. This alternative also did not resolve the
15 overload on the Pruntytown-Mt. Storm 500 kV line and caused the overload to
16 advance from 2014 to 2011. Allegheny Power's original TrAIL proposal, as
17 described by Mr. Hozempa, was considered as an alternative as well. This
18 alternative relieved the overloads; however, the ability to transfer power was less
19 by 750 MW and the cost was more by \$450 million than the Virginia and West
20 Virginia Segments, the 502 Junction Substation, the remainder of the 502 Junction
21 Segments, the Mt. Storm Expansion, the Meadow Brook Expansion, the Loudoun
22 Segment and the Loudoun Expansion.

1 Q. WERE ANY ELECTRICAL ALTERNATIVES THAT INVOLVED
2 UPGRADING OR EXPANDING EXISTING TRANSMISSION FACILITIES
3 CONSIDERED?

4 A. Consideration was given to reconductoring the Mt. Storm-Doubs 500 kV line, but
5 this was not a practical alternative since the line could not be removed from
6 service for the estimated two-year period required to complete the work. Also,
7 there would be a significant risk to the reliability of the mid-Atlantic and northern
8 Virginia areas while this line was being rebuilt.

9 Q. WHY DID PJM SELECT THE VIRGINIA SEGMENTS, ALONG WITH THE
10 502 JUNCTION SEGMENTS, THE 502 JUNCTION SUBSTATION, THE MT.
11 STORM EXPANSION, THE MEADOW BROOK EXPANSION, THE
12 LOUDOUN SEGMENT AND THE LOUDOUN SUBSTATION EXPANSION
13 FOR CONSTRUCTION OVER THESE ALTERNATIVES?

14 A. PJM selected these facilities for construction because all of the overloads in the
15 southern portion of the Allegheny Power Zone identified in Chart A were resolved
16 with this alternative. In addition, this alternative had the greatest transfer
17 capability increase of the studied alternatives, construction of the line by the 2011
18 timeframe is feasible and the project is the most cost effective solution to resolve
19 all identified reliability problems.

20 Q. IF, FOR REASONS BEYOND THE CONTROL OF TRAILCO, THE MEADOW
21 BROOK SEGMENT AND THE LOUDOUN SEGMENT CANNOT BE
22 CONSTRUCTED IN VIRGINIA, WILL RELIABILITY BENEFITS BE

1 PROVIDED IF THE LINE TERMINATES AT MEADOW BROOK
2 SUBSTATION?

3 A. Yes. The Pruntytown-Mt. Storm overload will be resolved as well as the voltage
4 violations around the Meadow Brook Substation. However, the Mt. Storm-Doubs
5 overload will still exist.

6 Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

7 A. Yes, it does.

Chart A

**Electric Reliability Problems
(Facility ownership shown in Chart B)**

	Electrical Occurrence	Electrical Result
1	Outage of Mount Storm – Greenland Gap Line #572A.	Mount Storm – Doubs 500 kV Line #512 exceeds its emergency rating and overloads.
2	Outage of Meadowbrook – Greenland Gap Line #572B.	
3	Outage of Hatfield – Black Oak 500 kV Line # 542.	
4	Outage of Bedington – Black Oak 500 kV Line # 544.	
5	Outage of Mount Storm – Greenland Gap 500 kV Line # 572A while Possum Point Unit #5 is unavailable.	
6	Outage of Meadowbrook – Greenland Gap Line #572B while Possum Point Unit #5 is unavailable.	
7	Outage of Hatfield – Black Oak 500 kV Line # 542 while Possum Point Unit #5 is unavailable.	
8	Outage of Bedington – Black Oak 500 kV Line # 544 while Possum Point Unit #5 is unavailable.	
9	Outage of Hatfield – Black Oak 500 kV Line # 542.	Mount Storm – Pruntytown 500 kV Line #510 exceeds its emergency rating and overloads.
10	Outage of Morrisville – Meadow Brook 500 kV Line #580 and the Meadow Brook – Greenland Gap Line #572B.	The 138 kV system voltage level around Meadow Brook Substation drops below acceptable limits and could lead to a voltage collapse in the area.

	Electrical Occurrence	Electrical Result
11	Outage of the Hatfield – Black Oak 500 kV Line #542 and Mount Storm – Doubs Line #512.	The 500 kV and 138 kV system voltage levels around Meadow Brook Substation drops below acceptable limits.
12	Outage of the Black Oak – Bedington 500 kV Line #544 and Mount Storm – Doubs Line #512.	

Chart B

Facility Ownership

Facility	Owner
Line #510	Allegheny Power
Line #512	Dominion
Lines #572A and #572B	Jointly owned by Allegheny Power and Dominion
Line #542	Allegheny Power
Line #544	Allegheny Power
Line #580	Jointly owned by Allegheny Power and Dominion
Meadow Brook Substation	Allegheny Power
138 kV system around Meadow Brook Substation	Allegheny Power
500 kV system around Meadow Brook Substation	Allegheny Power and Dominion

Exhibit SWG-2

Projected Summer Peak Loads (MW)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Cumulative
Mid-Atlantic Region	58742	59611	60965	61966	62850	63777	64648	65798	66845	67725	
% Growth		1.5%	2.3%	1.6%	1.4%	1.5%	1.4%	1.8%	1.6%	1.3%	15.3%
Northern Virginia - Dominion	5936	6037	6205	6316	6411	6532	6656	6780	6911	7035	
% Growth		1.7%	2.8%	1.8%	1.5%	1.9%	1.9%	1.9%	1.9%	1.8%	18.5%
Northern Virginia - APS	711	721	646	661	678	693	710	728	748	768	
% Growth		1.4%	-10.4%	2.3%	2.6%	2.2%	2.5%	2.5%	2.7%	2.7%	8.0%

Exhibit SWG-3

Historical Summer Peak Loads (MW)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Cumulative
Mid-Atlantic Region	48524	44302	49406	48397	51700	49430	54072	55569	53566	52049	59042	
% Growth		-8.7%	11.5%	-2.0%	6.8%	-4.4%	9.4%	2.8%	-3.6%	-2.8%	13.4%	21.7%
Northern Virginia - Dominion	4321	3939	4562	4618	5022	4688	5244	5399	5323	5143	6067	
% Growth		-8.8%	15.8%	1.2%	8.7%	-6.7%	11.9%	3.0%	-1.4%	-3.4%	18.0%	40.4%
Northern Virginia - APS	406	386	429	453	469	493	554	566	564	580	654	
% Growth		-4.9%	11.1%	5.6%	3.5%	5.1%	12.4%	2.2%	-0.4%	2.8%	12.8%	61.1%