

**DIRECT TESTIMONY
OF
STEVEN R. HERLING
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2007-_____**

1 **Q. Please state your name and business address.**

2 A. My name is Steven R. Herling and my business address is 955 Jefferson Avenue, Valley
3 Forge Corporate Center, Norristown, Pennsylvania 19403-2497.

4 **Q. By whom are you employed and in what capacity?**

5 A. I am Vice President of Planning for PJM Interconnection, L.L.C. ("PJM"). As PJM's
6 Vice President of Planning, I am responsible for the Capacity Adequacy Planning
7 Department, which develops the long-term load forecast for the PJM region and, in
8 consultation with load-serving entities, sets and enforces requirements for the sufficiency,
9 adequacy and availability of the generation resources needed to ensure reliable service to
10 loads; the Interconnection Planning Department, which evaluates interconnections to the
11 transmission system by new generation and merchant transmission projects; and the
12 Transmission Planning Department, which evaluates the reliability and market efficiency
13 of the transmission grid and develops the Regional Transmission Expansion Plan
14 ("RTEP").

15 **Q. Please describe your professional experience and educational background.**

16 A. I have been employed by PJM since May 1990, when I began work as an Engineer in the
17 Operations Planning Department. I was promoted to Senior Engineer in 1993 and to
18 Manager of the System Planning Department in 1994. I then held a number of

1 management positions until I was promoted to Executive Director, System Planning
2 Division in 2003. I was promoted to my current position in May 2004.

3 While at PJM, I have contributed to or led initiatives that resulted in a wide range of
4 milestone achievements in its evolution and growth as a regional transmission
5 organization ("RTO"), including the creation of the RTEP process, the development of
6 procedures and standard terms and conditions for generator and merchant transmission
7 interconnections and the reliability and adequacy aspects of successive integrations of
8 additional control areas that have more than doubled the size of the PJM market area in
9 the last five years.

10 In addition to my work for PJM, I have contributed to a wide range of activities of the
11 North American Electric Reliability Corporation ("NERC"), formerly the North American
12 Electric Reliability Council. Currently, I serve as vice-chair of the NERC Planning
13 Committee. I also have served on various regional and industry working groups and
14 committees addressing reliability and planning matters. I have testified on a number of
15 occasions on system planning and reliability issues in proceedings before the Federal
16 Energy Regulatory Commission ("FERC"), state commissions and legislative task forces.

17 Prior to joining PJM, I worked for the General Public Utilities Service Corporation for
18 three years in systems operations, where I was responsible for dispatcher training and
19 certification, operations planning activities and energy management system and
20 operational support tools. Prior to that, I worked for the American Electric Power Service
21 Corporation ("AEP") for eight years in bulk transmission planning. In that position, I
22 performed a range of power system analyses related to mechanical behavior of turbine-

1 generator shaft systems, the AEP 765 kV transmission system and generator and circuit
2 breaker dynamic modeling.

3 I am a licensed Professional Engineer in the state of Ohio. I hold a Bachelor of Science in
4 Electrical Power Engineering and a Master of Engineering in Electric Power Engineering,
5 both from Rensselaer Polytechnic Institute.

6 **Q. Please describe the purpose of your testimony.**

7 A. The purpose of my testimony is to describe PJM and PJM's regional transmission
8 expansion planning process ("RTEPP"). In particular, I will discuss the PJM RTEPP with
9 respect to the planned 502 Junction – Mt. Storm – Meadow Brook – Loudoun 500 kV
10 circuit ("502 Junction – Loudoun Line" or the "Project"), which is proposed to be built by
11 Virginia Electric and Power Company ("Dominion Virginia Power") and Trans-
12 Allegheny Interstate Line Company ("TrAILCo"), an affiliate of Allegheny Power
13 ("Allegheny").

14 **Q. Are Dominion Virginia Power, Allegheny and TrAILCo members of PJM?**

15 A. Each of Dominion Virginia Power and the three Allegheny operating companies is a
16 member of PJM and is considered a "Transmission Owner" under the Amended and
17 Restated Operating Agreement of PJM Interconnection, L.L.C. ("Operating Agreement").
18 TrAILCo became a PJM member effective March 28, 2007 and is considered a
19 Transmission Owner under the Operating Agreement.

20 **Q. How is the term "Transmission Owner" defined by the Operating Agreement?**

21 A. "Transmission Owner" means a PJM member that owns "Transmission Facilities" or
22 leases "Transmission Facilities" with rights equivalent to ownership. "Transmission
23 Facilities" means facilities that (i) are within the PJM region, (ii) meet the definition of

1 transmission facilities pursuant to FERC's Uniform System of Accounts or have been
2 classified as transmission facilities in a ruling by FERC addressing such facilities and (iii)
3 have been demonstrated to the satisfaction of PJM to be integrated with the PJM
4 transmission system and integrated into the planning and operation of the PJM
5 transmission system to serve all of the power and transmission customers within the PJM
6 region.

7 **Q. Please describe PJM.**

8 A. PJM is a regional transmission organization, or RTO, that ensures the reliability of the
9 electric transmission system under its functional control and coordinates the movement of
10 wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland,
11 Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West
12 Virginia and the District of Columbia.

13 The PJM system serves approximately 51 million people. PJM dispatches more than
14 164,000 megawatts ("MW") of generation capacity over more than 56,000 miles of
15 transmission lines – a system that serves nearly 20 percent of the U.S. economy. PJM's
16 wholesale electricity markets had more than \$22 billion in billings in 2005.

17 PJM presently has more than 450 members. These members/customers include power
18 generators, transmission owners, electricity distributors, power marketers and large
19 consumers. PJM's role as a federally regulated RTO means that it acts independently and
20 impartially in operating and planning the regional transmission system and in overseeing
21 the wholesale electricity market.

1 As part of its ongoing responsibilities as an RTO, PJM prepares the Regional
2 Transmission Expansion Plan, or RTEP, each year in order to analyze the electric supply
3 needs of the customers in the PJM region. The RTEP directs transmission upgrades to
4 address near-term needs within five years and assesses long-lead-time transmission
5 options requiring a planning horizon of 15 years or more. The RTEP provides forward
6 looking information as to the state of the supply and delivery infrastructure and identifies
7 future system needs, both in terms of reliability and market efficiency. The RTEP will
8 direct PJM's transmission owner members to address such needs through specific
9 transmission solutions. However, the information publicly disseminated through the
10 RTEP permits other resource providers, including generators, demand response providers
11 and merchant transmission owners, the opportunity to address identified system needs in a
12 manner that might delay or even obviate a transmission solution first identified in the
13 RTEP.

14 **Q. Does PJM have a written protocol for its transmission planning process?**

15 A. Yes. The process is set out in Schedule 6, entitled "Regional Transmission Expansion
16 Planning Protocol," of the Operating Agreement. The purpose and objective of Schedule
17 6 is stated as:

18 This Regional Transmission Expansion Planning Protocol
19 shall govern the process by which the Members shall rely upon the
20 Office of the Interconnection to prepare a plan for the enhancement
21 and expansion of the Transmission Facilities in order to meet the
22 demands for firm transmission service, and to support competition,
23 in the PJM Region. The Regional Transmission Expansion Plan to
24 be developed shall enable the transmission needs in the PJM
25 Region to be met on a reliable, economic and environmentally
26 acceptable basis.

1 **Q. What is PJM's planning process?**

2 A. A Transmission Owner's integration into PJM has the potential to enhance reliability and
3 economic benefits, as a result of inclusion in a larger, stronger and more diversified
4 portfolio of aggregated resources. In order to realize this mutual benefit for its members,
5 PJM plans the integrated system from a regional perspective in collaboration with each
6 individual Transmission Owner. PJM's authority and obligation to perform this function
7 is established in its Tariff and related agreements whereby certain planning functions that
8 historically had been managed by individual Transmission Owners have been
9 contractually assigned to PJM. This collaborative planning process - the RTEPP -
10 provides an open and inclusive forum for participation by all classes of market
11 participants and stakeholders.

12 PJM's RTEPP identifies transmission system upgrades and enhancements to preserve the
13 reliability of the transmission system. PJM's federally approved, region-wide planning
14 process provides an open, non-discriminatory framework to identify the system
15 enhancements that will ensure reliability and access by load to efficient power supply.

16 The RTEPP integrates transmission, generation and demand-side resources to address
17 transmission system constraints involving reliability and persistent congestion. The result
18 is one process that integrates many system factors, including:

- 19 • Forecasted load growth, demand-side-response efforts and distributed
20 generation additions;
- 21 • Interconnection requests by developers of new generating resources and
22 merchant transmission facilities;

- 1 • Solutions to mitigate persistent congestion and forward-looking economic
- 2 constraints and to ensure adequate allocation and funding of long-term
- 3 financial transmission rights;
- 4 • Assessments of the potential risk of aging infrastructure;
- 5 • Long-term firm transmission service requests;
- 6 • Generation retirements and other deactivations;
- 7 • Transmission owner-initiated improvements; and
- 8 • Load-serving entity capacity plans.

9 **Q. What is a “load-serving entity”?**

10 A. Under the Operating Agreement, a load-serving entity means an entity that serves end-
11 users (or ultimate consumers of electricity) within the PJM region and that has been
12 granted authority or has an obligation pursuant to state or local law, regulation or
13 franchise to sell electric energy to end-users located within the PJM region. The term
14 includes load aggregators, power marketers and duly designated agents of load-serving
15 entities.

16 **Q. Are the Transmission Owners actively involved in the PJM RTEPP with the**
17 **selection of the expansion plans?**

18 A. Yes. The Transmission Owners’ involvement is essential to make the process work. The
19 participation of the Transmission Owners’ planning groups is extremely important in the
20 development of the regional transmission plan. The Transmission Owners have first hand
21 knowledge of their systems and have developed relationships with load-serving entities
22 within their area of PJM. When PJM determines there are reliability violations, the
23 Transmission Owners are consulted to validate the violations and to suggest
24 recommended upgrades to relieve them. Additionally, each transmission owner performs

1 their own independent analysis to identify reliability violations from a more local zone
2 perspective. This approach leads to a more comprehensive package of upgrades that
3 incorporates resolutions to both local and regional reliability violations.

4 **Q. What is the magnitude of transmission upgrades authorized by PJM?**

5 A. More than \$4.2 billion of transmission upgrades and additions have been authorized by
6 PJM from the inception of the RTEPP in 1999 through December 2006. About \$3.5
7 billion of baseline transmission network upgrades across PJM ensure that established
8 reliability criteria will continue to be met. At the same time, \$673 million of additional
9 transmission upgrades will add more than 24,000 MW of new generating resources and
10 merchant transmission projects.

11 **Q. Describe what you mean by “baseline transmission network upgrades”?**

12 A. PJM’s baseline reliability assessments identify areas where the electric power system, as
13 forecasted over a specific time, is not in compliance with reliability standards developed
14 by NERC, PJM reliability standards and standards required by the Nuclear Regulatory
15 Commission applicable to nuclear plant licensees. Baseline assessment analyses lead to
16 recommendations for enhancement plans to ensure compliance with each set of standards.

17 **Q. Please explain the role of FERC and NERC in addressing transmission reliability.**

18 A. Historically, compliance with reliability standards developed by NERC was considered
19 voluntary. Because those standards set an industry standard for good utility practice,
20 compliance was generally universal by transmission owners and generation owners.
21 However, the Energy Policy Act of 2005 (“EPAct 2005”) created a mandatory compliance
22 and enforcement regime for reliability standards under the oversight of FERC. Pursuant
23 to EPAct 2005, FERC has designated NERC as the “Electric Reliability Organization” for

1 the United States, and NERC has proposed various reliability standards, most of which
2 have been adopted by FERC for enforcement as FERC rules, with mandatory compliance
3 set to begin on June 1, 2007. PJM has been applying the NERC reliability standards, and
4 the PJM deliverability standards used to apply them, on a mandatory basis since the
5 initiation of the RTEP process.

6 **Q. Are any of these reliability standards enforceable through the imposition of**
7 **monetary penalties for non-compliance?**

8 A. Yes. When compliance becomes mandatory, penalties for violation of the reliability
9 standards developed by NERC and approved by FERC may be as high as \$1 million per
10 violation per day.

11 **Q. What reliability criteria does PJM evaluate in the development of the RTEP?**

12 A. PJM tests a wide range of reliability criteria in the development of the RTEP. All
13 reliability criteria testing procedures employed in the development of the RTEP include
14 detailed assumptions regarding load levels, transfer levels and generation patterns. The
15 tests are referred to as “bright line” tests because there can be no doubt as to whether the
16 criteria are satisfied or violated. The specific assumptions and requirements associated
17 with each criterion are documented and the analysis procedures are posted on the PJM
18 web site.

19 PJM tests for compliance with all reliability criteria imposed through the NERC Planning
20 Standards. NERC Category A criteria require that, for all facilities in service, equipment
21 thermal ratings and system voltage limits are respected and that the system is stable.
22 NERC Category B criteria impose similar requirements with one facility removed from
23 service. This is referred to as the “n minus 1” or “n-1” criteria. These criteria ensure that

1 the system continues to remain reliable upon the instantaneous outage of a transmission
2 element. PJM ensures compliance with NERC Category A and B through the more
3 rigorous deliverability criteria used in testing the PJM system.

4 PJM tests for both Load Deliverability and Generator Deliverability. The Load
5 Deliverability test evaluates the capability of the transmission system to deliver energy
6 from the remainder of the PJM region to a portion of the PJM region experiencing higher
7 than normal unavailability of generating capacity. The Generator Deliverability test
8 evaluates the capability of the transmission system to deliver energy from a grouping of
9 generators experiencing higher than normal availability to the remainder of the PJM
10 region experiencing lower than normal generator availability. The deliverability tests
11 establish a link between generation resource adequacy for the region and the transmission
12 adequacy necessary to deliver the generation resources to loads.

13 NERC Category C criteria require the system to be stable and equipment thermal ratings
14 and system voltage limits to be respected for less probable system events. Such events
15 include second contingencies, involving the loss of one system element followed by
16 system readjustments and then the loss of a second system element. This is referred to as
17 the “n minus 2” or “n-2” criteria. Category C also includes events such as the loss of two
18 circuits on a single tower line or a single faulted system element followed by a circuit
19 breaker failing to operate, what is referred to as a stuck breaker. While generation re-
20 dispatch is allowed after the first element loss in an n-2 event, PJM does not dispatch
21 generation in anticipation of loss of tower line events or stuck breaker events, and the test

1 of compliance with these criteria, therefore, does not allow generation patterns to be
2 adjusted.

3 In addition, PJM tests for compliance with all locally established reliability criteria (i.e.,
4 Transmission Owner reliability criteria). Such criteria may, for example, require a higher
5 degree of reliability through more stringent standards in urban areas. In all cases, such
6 local criteria are documented and posted on the PJM web site.

7 **Q. Please explain the significance of PJM's five-year baseline RTEP analysis.**

8 A. PJM performs a five-year baseline analysis to assess compliance with reliability criteria
9 and recommend transmission upgrades to meet near-term demand growth for customers'
10 electricity needs not only from existing generation, but from new resources that arise from
11 interconnection requests by developers seeking to construct new generating plants and
12 merchant transmission facilities. The five-year baseline component of PJM's RTEP
13 includes the following:

- 14 • Solutions to address baseline transmission constraints revealed by reliability
15 criteria violations observed in power-flow and related studies;
- 16 • Cost responsibility allocations for baseline reliability upgrades;
- 17 • "Direct connection" transmission enhancements associated with generation and
18 merchant transmission interconnection requests; and
- 19 • Necessary "network" transmission enhancements in response to
20 interconnection requests.

21 Approved transmission upgrades identified through the five-year planning process have
22 ensured continuing compliance with all applicable reliability criteria and have enabled the
23 interconnection of more than 19,000 MW of new generation to the grid.

1 **Q. Does PJM engage in planning beyond a five-year horizon?**

2 A. Yes. The development of the five-year baseline plan is only the first step in a
3 comprehensive 15-year planning process. PJM's 15-year planning horizon permits the
4 consideration of many long-lead-time transmission options. This type of planning enables
5 PJM to address both the reliability and economic performance of the transmission grid
6 based on the impacts of long-term load growth and a wide range of market factors.

7 The scope of 15-year planning encompasses reliability-based sensitivity analyses. These
8 sensitivity studies examine the long-term reliability impacts of uncertainty with respect to
9 assumptions about economic growth, the extent of loop flows within PJM and
10 assumptions about generation resources.

11 PJM also conducts market efficiency studies as part of each RTEP cycle's 15-year
12 analyses. Market efficiency analyses address such factors as the impacts of fuel and
13 emissions-related prices, generation retirements and the delivery needs of the new
14 "clustered" generation projects, such as those emerging in PJM associated with large
15 baseload Midwest and northern Pennsylvania coal projects, nuclear generation in
16 Maryland and northern Virginia, Appalachian Ridge and northern Illinois wind farms and
17 natural gas pipeline access projects. This analysis provides market participants with both
18 historic congestion information and fifteen year econometric projections of the costs and
19 benefits of proposed transmission projects.

20 As a result of the first such 15-year analysis, in June 2006, PJM formally endorsed further
21 study and evaluation of a number of backbone transmission proposals to meet the long-
22 term reliability and economic needs of the PJM region. These initial proposals, together

1 with several more transmission owner proposed projects and about a dozen more member
2 proposed projects, are being analyzed to identify the most effective set of projects to
3 resolve identified reliability and market efficiency issues.

4 **Q. Please explain the significance of PJM’s request for the “NIETC Designation.”**

5 A. In its August, 2006 National Electric Transmission Congestion Study, the United States
6 Department of Energy (“DOE”) identified the Atlantic coastal area from metropolitan
7 New York southward through northern Virginia as one of two “Critical Congestion
8 Areas” in the U.S. considered by DOE to be critically important to remedy existing or
9 growing congestion problems because the current and/or projected effects of the
10 congestion are severe.

11 In response to the DOE study, PJM has filed a request for the designation of three
12 “National Interest Electric Transmission Corridors” (NIETC Designation) to facilitate the
13 type of multi-state projects represented by backbone transmission proposals, including the
14 planned 502 Junction – Loudoun Line.

15 **Q. How are reliability projects built and paid for?**

16 A. PJM’s Consolidated Transmission Owners Agreement obligates Transmission Owners to
17 build transmission facilities approved by PJM that are needed to meet reliability standards
18 and other reliability requirements. This requirement provides all PJM stakeholders much
19 needed certainty in resolving reliability concerns. Regardless of who bears responsibility
20 for the actual construction of new transmission facilities, the cost of such facilities is paid
21 for by load-serving entities in the transmission zones that cause the need for the project.
22 Costs are allocated among the transmission zones in proportion to their contribution to the
23 reliability criteria violation resolved by the required transmission facility. It should be

1 noted, however, that the cost allocation procedure is based on a number of specific rules
2 that may have the result that not all load customers contributing to the need for a
3 transmission upgrade bear a share of the cost of that upgrade. For example, in cases
4 where multiple reliability criteria violations are resolved, as with the 502 Junction –
5 Loudoun Line, only the most severe violation is used to establish cost allocation.
6 Transmission owners recover their costs through FERC-approved transmission service
7 rates.

8 Projects associated with the interconnection of new generation and merchant transmission
9 projects must meet specified financial and construction-related obligations. These
10 requirements enable PJM to ensure that construction of upgrades remains on schedule and
11 required in-service dates are met.

12 **Q. Does PJM coordinate transmission planning with neighboring systems?**

13 A. Yes, PJM coordinates its planning processes with neighboring systems to address issues of
14 mutual concern. PJM participates in such interregional planning under arrangements with
15 the Midwest Independent Transmission System Operator, the Independent System
16 Operator of New England, the New York Independent System Operator, the Tennessee
17 Valley Authority and Progress Energy.

18 **Q. Does the RTEPP involve others outside of the PJM organization?**

19 A. Yes. The RTEPP is open, transparent and collaborative from start to finish. Forums and
20 processes provide opportunities for stakeholders to help PJM improve the transmission
21 grid, ensuring reliability and access to robust, competitive markets. The activities of the
22 Transmission Expansion Advisory Committee (“TEAC”) provide the primary forum for
23 the ongoing exchange of ideas, discussion of issues and presentation of planning findings.

1 PJM governing committees such as the Members Committee, Planning Committee and
2 Transmission Owners Agreement Administrative Committee provide additional
3 opportunities for stakeholders to provide input.

4 Ad hoc PJM stakeholder groups are commissioned periodically to address specific issues.
5 Such groups are addressing issues associated with 15-year planning, market efficiency and
6 cost allocation.

7 In addition, PJM staff liaisons to federal and state regulatory bodies, including the
8 Organization of PJM States, Inc., continue to foster two-way communication and the
9 resolution of planning issues.

10 **Q. Please describe the relationship of the TEAC to the RTEPP.**

11 A. The TEAC operates under specific provisions of the Operating Agreement. TEAC
12 activities are at the core of stakeholder input in the RTEPP. The scope of the TEAC's
13 responsibility includes the review of and the provision of comments and input on the
14 following:

- 15 • Scope and assumptions of RTEP studies, including economic/market
16 efficiency analysis;
- 17 • RTEP analysis at defined points during the RTEP cycle;
- 18 • RTEP recommendations to be proposed to PJM for endorsement; and
- 19 • Specified RTEP matters as requested by PJM.

20 TEAC participation is open to all transmission customers, any other entity proposing to
21 provide transmission facilities to be integrated into the PJM region, all PJM members,
22 representatives of state commissions, the agencies and offices of state consumer advocates
23 of states in the PJM region and any other interested parties. This broad group of

1 constituents fosters a wide range of opinions, comments and advice on RTEP process plan
2 development and recommendations for PJM Board approval.

3 Following the presentation of analysis assumptions or results to the TEAC, stakeholders
4 are invited to provide written comments. These comments are provided to the PJM Board
5 for their consideration and serve as the basis for on-going dialogue at subsequent TEAC
6 meetings.

7 **Q. When was the RTEP that includes the 502 Junction – Loudoun Line approved?**

8 A. In June 2006, PJM approved the RTEP that includes a new 500 kV transmission line to
9 address reliability needs, specifically the 502 Junction – Loudoun Line. The line runs
10 from the proposed 502 Junction Substation in southwestern Pennsylvania to the Loudoun
11 Substation in northern Virginia with intermediate connections at the Mt. Storm Substation
12 in West Virginia and the Meadow Brook Substation in Frederick County, Virginia.

13 **Q. Which portion of the line will be built by Allegheny?**

14 A. Allegheny is the transmission owner responsible for constructing the 502 Junction – Mt.
15 Storm – Meadow Brook portion of this line, as well as approximately 16 miles of the
16 Meadow Brook – Loudoun portion of the line. It is my understanding that TrAILCo, an
17 affiliate of Allegheny, will construct the portion of the line designated to Allegheny.

18 **Q. Which portion of the line will be built by Dominion Virginia Power?**

19 A. The RTEP designated Dominion Virginia Power as the transmission owner responsible
20 for constructing the remainder of the line, as well as required substation upgrades at Mt.
21 Storm.

1 **Q. Why is this line necessary?**

2 A. Studies revealed the need for a major new 500-kV transmission line to avoid reliability
3 criteria violations observed to occur by 2011. These violations include potential line
4 overloads and voltage problems. Analysis of various options yielded a recommendation
5 for this new line from the western part of PJM to feed the mid-Atlantic and northern
6 Virginia load centers. These load centers encompass an area of PJM that continues to
7 experience significant economic growth – growth that requires access to additional
8 sources of electricity and the transmission infrastructure to provide it. Mr. Gass’s
9 testimony discusses the studies performed by PJM that determined the need for this line,
10 as well as the load growth that has contributed to the need for the Project.

11 **Q. What would be the impact on northern Virginia if the Project is not built?**

12 A. Without the Project, northern Virginia will be at risk for experiencing transmission line
13 overloads, which could lead to substation voltage drops, voltage collapses and rolling
14 blackouts in the northern Virginia region.

15 **Q. What reliability criteria violations did PJM identify that led to the inclusion of the
16 502 Junction – Loudoun Line in the RTEP?**

17 A. PJM identified a number of reliability criteria violations that led to the inclusion of the
18 502 Junction – Loudoun Line in the RTEP. These included violations of Generator
19 Deliverability criteria, Load Deliverability criteria and second contingency criteria. The
20 Generator Deliverability criteria violations reflect the inability of the bulk transmission
21 system to deliver energy from mid-western generation sources to eastern load centers
22 including Virginia, Washington, D.C., Maryland, Pennsylvania, New Jersey and Delaware
23 during periods of reduced availability of eastern generation. Virginia, Maryland and New

1 Jersey are among the largest importers of energy, on a percentage basis, in the country. If
2 transmission capability is insufficient to deliver western resources when required,
3 emergency operating procedures are implemented, possibly including reducing
4 transmission system voltages (referred to as brown-outs) and curtailing customer load
5 (referred to as rotating black-outs).

6 The Load Deliverability criteria violations reflect the inability of the bulk transmission
7 system to deliver energy into specific load centers experiencing reduced availability of
8 generation, from resources on the remainder of the PJM system. These violations impact
9 the mid-Atlantic region of the PJM system with the same consequences described with
10 respect to the Generator Deliverability violations.

11 The second contingency criteria, referred to as the n-2 criteria, involve the loss of two
12 transmission elements into an area. In this case, if the two 500-kV transmission lines
13 feeding the Meadow Brook Substation in the northern Virginia/Winchester area are lost,
14 the underlying transmission system is not adequate to supply customer load and
15 widespread voltage criteria violations will result, with the potential for voltage collapse
16 and loss of customer load.

17 **Q. Are there specific local reliability criteria violations in northern Virginia that will be**
18 **addressed by the 502 Junction-Loudoun Line?**

19 A. Yes, separate studies by PJM, Dominion Virginia Power and Allegheny have shown
20 increasing load demand in this area and the need for additional infrastructure to meet this
21 demand. Mr. Ronnie Bailey will discuss those specific criteria violations in his testimony.

1 **Q. Are there transmission congestion issues associated with the inclusion of the 502**
2 **Junction – Loudoun Line in the RTEP?**

3 A. The 502 Junction – Loudoun Line was included in the RTEP to resolve a number of
4 reliability criteria violations and not, specifically, for the purpose of mitigating
5 transmission system congestion. However, the transmission facilities experiencing these
6 criteria violations have resulted in significant congestion during recent years.
7 Transmission congestion in the corridor including these facilities exceeded \$1.2 billion in
8 2005 and \$750 million in 2006. Initial analyses indicate that the 502 Junction – Loudoun
9 Line may reduce system generation production cost by over \$140 million per year and
10 gross payments by load customers by over \$600 million per year. The northern Virginia
11 area will experience congestion relief (i.e., lower wholesale electricity prices) through the
12 implementation of this project. These simulations showed average locational energy
13 prices on the Dominion Virginia Power system decreasing by over \$5.50 per MWhr of
14 energy consumed over an annual period.

15 **Q. How was the Project chosen and designated to Allegheny and Dominion Virginia**
16 **Power for construction?**

17 A. As I previously explained, when PJM determines there are reliability violations, the
18 Transmission Owners are consulted to validate the violations and to suggest
19 recommended upgrades to relieve them. Additionally, each Transmission Owner performs
20 its own independent analysis to identify reliability violations from a more local zone
21 perspective. This approach leads to a more comprehensive upgrade that incorporates
22 resolutions to both local and regional reliability violations. After PJM identifies
23 reliability projects needed to address deliverability criteria violations, Schedule 6 of the

1 Operating Agreement requires PJM to designate one or more transmission owners or other
2 entities to construct, own and/or finance the recommended transmission enhancement(s)
3 or expansion(s).

4 Allegheny's and Dominion Virginia Power's transmission planning groups worked closely
5 with PJM in validating criteria violations and formulating the 502 Junction – Loudoun
6 Line as the solution to the identified criteria violations. Ultimately, the 502 Junction –
7 Loudoun Line was determined to be the best solution for addressing the reliability issues
8 that were identified. The 502 Junction – Loudoun Line segments designated to
9 Allegheny and Dominion Virginia Power were those that are physically located within
10 their respective service territories. The substation upgrades associated with the Project
11 were designated to the owners of each substation requiring upgrade.

12 **Q. What other alternatives to the 502 Junction-Loudoun Line were considered?**

13 A. PJM assessed the ability of alternative solutions to resolve the reliability criteria
14 violations that led to the inclusion of the 502 Junction – Loudoun Line in the RTEP,
15 including market driven additions of new generation capacity and demand side
16 management resources located in the corridor east of the 500 kV western interface
17 facilities. PJM determined the levels of new generation and demand side management
18 resources that would be required to resolve the reliability criteria violations in the area. At
19 this time, sufficient resources have not been identified by the market or progressed
20 through the interconnection process to suggest that they are a viable alternative to the
21 addition of transmission infrastructure. The recent notice of additional generation
22 retirements in Washington, D.C. only exacerbates this situation. PJM also evaluated other
23 transmission solutions, including specific projects that were proposed within the

1 Allegheny Mountain Corridor (a geographical area including portions of northern West
2 Virginia, southwestern Pennsylvania, western Maryland and northern Virginia) for
3 inclusion in the RTEP. PJM's studies indicate that these alternatives were, in some cases,
4 not sufficient to resolve the forecast reliability violations, could not resolve the violations
5 in a timely manner or were not as effective as the 502 Junction – Loudoun Line with
6 respect to resolving the reliability criteria violations. Scott Gass will testify to this further
7 in his testimony.

8 **Q. What is the impact of the revised 2007 load forecast on the necessity for the 502**
9 **Junction-Loudoun Line?**

10 A. The revised 2007 load forecast demonstrates that the need for the Project is even more
11 critical than shown in the 2006 RTEP. The load forecasts for both the Allegheny and
12 Dominion Virginia Power transmission zones increased between 2006 and 2007. In
13 addition, changes were made to the distribution of load in the Dominion Virginia Power
14 network model. These changes, coupled with others, have resulted in increased west-to-
15 east energy flows on constrained transmission facilities through the Allegheny Mountain
16 Corridor and a number of reliability criteria violations occurring earlier in the 15-year
17 planning horizon than previously observed.

18 **Q. What other changes have resulted in increased west-to-east flows on constrained**
19 **transmission facilities through the Allegheny Mountain Corridor?**

20 A. A number of system changes have been integrated into the 2007 RTEP baseline analysis
21 or are currently being evaluated which will increase flows to the eastern portion of PJM
22 beyond what had been projected in the 2006 RTEP. The most significant changes are the
23 addition of a 1,000 MW firm transmission service from MISO to PJM and the proposed

1 retirement of the Benning Road and Buzzard Point generating stations in Washington,
2 D.C. The Transmission Service Agreement to deliver 1000 MW of capacity and energy
3 from MISO to PJM was executed by FirstEnergy after completion of the 2006 RTEP and
4 has been integrated into the 2007 RTEP baseline. This firm delivery increases flow on
5 500 kV transmission facilities through the Allegheny Mountain Corridor and across
6 central Pennsylvania. The Benning Road and Buzzard Point retirements have not yet been
7 integrated into the RTEP, but will increase energy flows through the Allegheny Mountain
8 Corridor to customer loads in Washington, D.C.

9 **Q. What will be the result of these changes?**

10 A. The 2007 RTEP analysis has not yet been completed. However, the increased energy
11 flows to load centers in northern Virginia and eastern PJM will require transmission
12 system upgrades to be constructed, in addition to the 502 Junction – Loudoun Line, earlier
13 than the timeframe provided in the 2006 RTEP. The Proposed Route for the Meadow
14 Brook – Loudoun circuit will still effectively meet the increased needs of the northern
15 Virginia area. However, regardless of whether Dominion Virginia Power constructs the
16 Proposed Route or the Alternate Route, additional transmission capability will be required
17 to meet the broader needs of the PJM system.

18 **Q. Will PJM approval of later projects eliminate the need for the Project?**

19 A. No. Projects approved in the RTEP process become part of our planning for the future, so
20 new projects will be approved using models that incorporate previously approved
21 projects, including the 502 Junction – Loudoun Line. While it is true that the process
22 does allow for others to submit alternative solutions, this can only be done within a certain
23 timeframe and is based on the construction requirements and magnitude of the particular

1 project. For the 502 Junction – Loudoun Line this period has passed. In order to meet the
2 need for the 2011 timeframe, the 502 Junction – Loudoun Line must move forward.

3 **Q. Who within PJM had the primary responsibility for preparing or supervising the**
4 **preparation of the RTEP studies that identified the need for the 502 Junction –**
5 **Loudoun Line?**

6 A. As Manager of the Transmission Planning Department, Scott Gass supervised the creation
7 of the 2011 Regional Transmission Expansion Planning base case. He also supervised all
8 of the analyses conducted with the case, including model adjustments, identifying
9 reliability criteria violations, and formulating solutions to the violations. At that time, Mr.
10 Gass was one of my direct reports.

11 **Q. Does that conclude your direct testimony?**

12 A. Yes, it does.