

---

---

**POTOMAC APPALACHIAN TRANSMISSION HIGHLINE**  
EXPERT WITNESS TESTIMONY PRESENTED BEFORE THE VIRGINIA STATE  
CORPORATION COMMISSION

---

---

How this testimony demonstrates the need for independent  
Comprehensive Energy Planning

Prepared By

Richard Klein  
**COMMUNITY & ENVIRONMENTAL DEFENSE SERVICES**  
811 Crystal Palace Court  
Owings Mills, Maryland 21117  
410-654-3021  
Fax: 410-654-3028  
E-mail: [info@ceds.org](mailto:info@ceds.org)  
Web Page: [ceds.org](http://ceds.org)

On Behalf Of

**DORCHESTER CITIZENS FOR SAFE ENERGY**  
**STOP PATH WEST VIRGINIA, INC.**  
**WEST VIRGINIA CITIZENS AGAINST PATH**

November 24, 2009

# CONTENTS

EXECUTIVE SUMMARY.....	1
Need for PATH Based On Flawed Planning.....	1
PATH Reduces Reliability of Electric Service.....	2
More Effective & Economical Alternatives To PATH Not Considered.....	2
PATH Will Increase Coal Power Plant Profits & Degrades Air Quality.....	2
PATH Electromagnetic Field (EMF) Threatens Public Health.....	3
State Review Process Insufficient to Evaluate All Reasonable Alternatives.....	3
PATH Shows Why Comprehensive Energy Planning Is Urgently Needed.....	3
INTRODUCTION.....	5
ABOUT THIS SUMMARY.....	6
BACKGROUND OF THE EXPERTS.....	7
IS PATH NEEDED TO KEEP THE LIGHTS ON?.....	9
PATH Need Justification Violated Good Planning Principles.....	10
PATH Need Based On Highly Unreliable Extrapolation.....	13
PATH Need Assessment Ignored Demand Side Resources.....	14
PATH Need Assessment Ignored Energy Efficiency Resources.....	15
PATH Need Based on Outdated Peak-Load Forecasts.....	15
PATH Not Needed To Import Power To Mid-Atlantic.....	16
Current Demand Resources & Energy Efficiency Postpones Need for PATH 4-8 Years .....	16
PJM Projections Cannot Be Verified.....	16
PATH Alternatives Not Given Reasonable Consideration.....	17
Alleged Violations Used To Justify PATH Can Be Solved Better With Alternatives.....	19
Costs of PATH Not Compared With Alternatives.....	20
Examples of the Better Alternatives To PATH Good Planning Might Reveal.....	21
PATH Will Decrease Reliability of Electric Service.....	22
PATH Provides Western Electric Generators Free Access To Eastern Markets.....	24
Problems Could be Resolved With Alternatives Far Less Costly Than PATH.....	24
PJM RTEP PLANNING HAS A VERY NARROW FOCUS.....	26
PATH INCREASES AIR POLLUTION.....	26
PATH Would Increase Power Production from Coal-Fired Plants.....	27
PATH Would Displace Cleaner Energy Sources.....	27
PATH Will Increase Air Pollution.....	28
PATH Threatens Public Health.....	30
PATH Will Increase Emissions of Climate-Changing Greenhouse Gases (GHG).....	30
PATH Will Increase Acid Deposition ( <i>aka Acid Rain</i> ).....	31
PATH Will Increase Water Pollution.....	31

PATH Will Increase Haze, Further Harming Scenic Views. ....	31
PATH ELECTROMAGNETIC FIELD THREATENS PUBLIC HEALTH.....	31
Current EMF Safety Limits Are Not Adequate To Protect Human Health. ....	33
EMF Levels Caused By PATH Are 100 Times Greater Than Safe Levels.....	34
EMF & Increased Likelihood of Cancer May Be Due to DNA Damage.....	34
EMF Exposure Also Linked To Other Diseases. ....	35
Adding PATH To Existing Transmission Line Corridors Increases EMF Health Risk	
.....	36
Summary of PATH EMF Human Health Effects. ....	37
STATE TRANSMISSION LINE REVIEW CRITICAL, BUT MUST BE SUPPORTED BY	
GOOD PLANNING	
.....	38
Minimal Experience with Major Transmission Line Projects.....	38
Insufficient Time To Thoroughly Review Transmission Lines.....	39
Lack of Funds for Independent Study; Heavy Reliance upon Applicant Information... .	39
Transmission Is the Only Option Considered to Resolve Reliability Issues. ....	39
WHY COMPREHENSIVE ENERGY PLANNING IS ALSO NEEDED. ....	40
THE EXPERTS' RECOMMENDATIONS FOR IMPROVING STATE REVIEWS. ....	41

## **EXECUTIVE SUMMARY**

---

The Potomac-Appalachian Transmission Highline (PATH) project is a 765-kilovolt (kV) transmission line proposed to extend for 275 miles from Amos, West Virginia through Virginia to end at Kempton, Maryland. The applicants seeking approval for this project claim PATH is needed to maintain reliable, economical electric service. However, the transmission line also has the potential to cause a number of negative impacts. An increasing number of citizen groups, nonprofit organizations, and government officials have been asking whether PATH is truly the best way to provide affordable, reliable, and environment-friendly electric service. All have had difficulty gaining full answers to these questions from the applicants.

This document summarizes the testimony of five highly-qualified and highly-respected expert witnesses presented to the Virginia State Corporation Commission regarding the merits of the PATH project. Four of these witnesses testified on behalf of the Sierra Club, the fifth at the request of Alfred and Irene Ghiorzi. This testimony constitutes the first thorough and independent review of the PATH project conducted in the three states. Following is a summary of the findings of these five professionals.

### **Need for PATH Based On Flawed Planning**

The experts concluded that the applicants have failed to demonstrate that PATH is the best alternative for maintaining reliable, economical electric service because the applicants' analyses failed to conform to basic electric planning principles. Specifically:

- analyses of future electricity needs were based on extrapolations (guesstimates) rather than the required contingency analyses;
- the analyses failed to include new electric generating facilities despite the fact that electric planning principles required factoring the additional power provided by these facilities into the analyses;
- anticipated reductions in energy use due to increased efficiency were not factored into the analyses even though basic electric planning principles required the inclusion of these reductions;
- the applicant's analyses were based upon pre-recession estimates of future peak electricity needs;
- these flaws were used to justify PATH based on the need to import more electricity into the Mid-Atlantic states whereas the experts showed that existing import capabilities are sufficient for the foreseeable future; and
- the applicants did not provide documentation of the underlying assumptions, which made it impossible for the experts or Virginia officials to verify the accuracy of the applicants' analyses.

### **PATH Reduces Reliability of Electric Service**

Testimony from the experts showed that PATH will likely inhibit the construction of new electric generating facilities in the east. Instead, cities like Baltimore, Philadelphia, Richmond, and Washington, D.C. will become increasingly dependent on electricity generated at distant power plants and carried by long, highly vulnerable transmission lines such as PATH.

The inhibition results from *economic dispatch* where the cheapest sources are drawn upon first when more electricity is needed. Coal-fired power plants presently provide the cheapest source of electricity and are mostly located in the west (e.g. Ohio valley). PATH will relieve congestion which minimizes the flow of electricity from coal-fired power plants from the west to the lucrative markets in the east. Once PATH relieves congestion the more expensive plants located in the east will be at a severe competitive disadvantage. The experts showed how this disadvantage will inhibit both the construction of new power plants in the east and even the expansion of existing, eastern generating facilities.

Over time, eastern populations will become increasingly dependent on very long transmission lines to bring them electricity from distant power plants. One of the experts likened this highly undesirable scenario to running an electric cord across the street to your neighbor's home to run your toaster. The experts also explained why this scenario *increases* the probability of future blackouts. The national security implications of reliance upon PATH and other long transmission lines are obvious.

### **More Effective & Economical Alternatives To PATH Not Considered**

PATH is a \$1.8 billion project which will be paid for by the 51 million people living throughout a 13-state region. The experts showed how alternatives costing less than \$100 million could resolve the reliability issues PATH is purported to address. The experts also showed how these alternatives would be even more effective than PATH at enhancing the reliability of electric service with a fraction of the impact to public health and the environment.

### **PATH Will Increase Coal Power Plant Profits & Degrades Air Quality**

PATH threatens public health and the environment by increasing production at our dirtiest electric source: coal-fired power plants. PATH will also bring about a reduction of electricity output from cleaner sources, such as natural gas plants, wind, solar, etc. One expert showed how PATH will increase the amount of pollution emitted from coal-fired plants by nearly *eight million tons per year*. At a time when the world is desperately struggling to halt climate change by cutting greenhouse gas emissions, PATH would *increase* emissions from a 13-state area by 2.5%! PATH would increase emissions of air pollutants threatening human health by 5% from this 13-state area. The experts showed that alternatives to PATH would not only maintain reliable electric service but reduce emission of greenhouse gases and other pollutants which harm our health.

### **PATH Electromagnetic Field (EMF) Threatens Public Health**

The health effects of electromagnetic fields (EMF) has long been a controversial subject in the context of transmission lines. Columbia University Professor Martin Blank testified about recent research which shows ample scientific evidence to support concerns about the effects of transmission line EMF on human health. This evidence now indicates that EMF may increase the risk of many forms of cancer, particularly childhood leukemia, as well as Alzheimer's disease and senile dementia. The level of EMF at the edge of the proposed PATH right-of-way would be a hundred times higher than the levels shown safe by recent scientific research. In some locations the 765-kilovolt PATH line would be added to right-of-ways with existing 500- and 138-kilovolt transmission lines. Professor Blank showed the addition of PATH would elevate EMF and increase the health threat to nearby residents.

### **State Review Process Insufficient to Evaluate All Reasonable Alternatives**

There exists a number of severe impediments to conducting a thorough review of transmission line proposals with the current process administered by the Maryland and West Virginia PSCs and the Virginia SCC. These impediment boil down to six limitations:

- minimal experience with major transmission line projects;
- insufficient time for a thorough review;
- lacks of funds for independent verification of applicant data and the study of alternatives;
- heavily reliance upon the applicants for information;
- transmission is really the only option considered to resolve reliability issues; and
- the adversarial nature of the review process which impedes the free flow of information and collaborative decision-making.

### **PATH Shows Why Comprehensive Energy Planning Is Urgently Needed**

The "planning" which resulted in the proposal to construct PATH had an extremely narrow focus. Assumptions were made which overstated the need to increase electricity import capabilities to the east while ignoring alternatives such as new generating facilities or increased energy efficiency. The only option considered were new transmission lines. The testimony from the experts shows that we need a process in addition to the adversarial approach used by Virginia (as well as Maryland and West Virginia) to review transmission line project proposals. We need an independent comprehensive energy planning process which:

- begins with estimates of future energy needs (including independent verification of industry projections);

- followed by identification of all reasonable alternatives for meeting those needs;
- then ranking of each alternative with regard to the factors affected by our energy choices (reliability, cost, national security, climate change, public health, etc.); and
- ends with a listing of preferred alternatives - those which best serve our needs and those of future generations.

## **INTRODUCTION**

---

The Potomac-Appalachian Transmission Highline (PATH) project is a 765-kilovolt (kV) transmission line proposed to extend for 275 miles from a large coal-fired power plant at Amos, West Virginia through Virginia to end at Kempton, Maryland.<sup>1</sup> Community & Environmental Defense Services ([CEDS](#)) is assisting citizen groups in Maryland and West Virginia with concerns regarding PATH and another major transmission line project - the Mid-Atlantic Power Pathway (MAPP)<sup>2</sup>.

For the most part, members of these groups had the same initial reaction to both transmission line proposals - a strong desire to stop the project. But (as is usually the case) this initial reaction was followed by questions such as:

1. Is the project truly needed?
2. If there is a genuine need, then is it the best option to meet that need?
3. If it is the best option, then does it really need to come so close to my home?
4. If it does then how can it be designed to minimize negative effects?

This initial reaction of stop the project followed by lots of questions is a typical reaction to proposals which have the potential to pose a substantial threat to quality of life. However, if the questions are answered fully and honestly then most people will eventually find a way to live with a project proven to be truly needed and well-designed. But in the case of both PATH and MAPP citizens as well as their elected officials have had a great deal of difficulty getting the applicants to provide full, honest answers to their questions.

In October, 2009, citizens had their first opportunity to see the results of a truly independent review of the merits of either PATH or MAPP. This opportunity took the form of testimony from five expert witnesses. The testimony was submitted to the Virginia State Corporation Commission (SCC) regarding the PATH transmission line. Four of the five experts were retained by the Sierra Club. The fifth, Professor Martin Blank, testified on behalf of Alfred and Irene Ghorzi.

In May, 2009, the Virginia SCC received an initial application and supporting documents, totaling 1,346 pages, from the applicants: PATH Allegheny Virginia Transmission Corporation, which is a subsidiary of Allegheny Transmission Company, LLC ("PATH-Allegheny"), which is

---

<sup>1</sup> Maps showing the proposed route for the PATH project can be viewed by clicking the following link: <http://www.pathtransmission.com/maps/default.asp>

<sup>2</sup> MAPP was originally proposed as a 230-mile project extending from Possum Point, VA through southern Maryland and the Delmarva peninsula to end on the New Jersey Shore. The Delaware portion was put on hold in April, 2009. After failing to justify why the shortened line was still needed, the Maryland PSC suspended the review of MAPP. For further detail visit: <http://www.ceds.org/DCSE.html>

wholly controlled by Allegheny Energy, Inc. The review conducted by the five experts was largely based upon the documents submitted by the applicant to the Virginia SCC.

The background of the five experts, which is provided later in this document, shows that each is a highly-qualified and highly-respected professional whose clients include electric utilities, consulting companies servicing utilities, the government agencies which regulate these industries, universities, energy think-tanks, and occasionally citizen groups like the Sierra Club. In other words, these were not hired-guns charged with trashing PATH but professionals with impeccable credentials who would not flinch from supporting the need for PATH if that was what the scientific evidence showed.

This document attempts to summarize the 450 pages of testimony and supporting material presented to the Virginia SCC. The goal of the summary is to provide citizens concerned about PATH, and indirectly MAPP, with the first independent assessment of two of the four questions presented above:

1. Is the PATH project truly needed?
2. If there is a genuine need, then is PATH the best option to meet that need?

If the answer to the first two questions were yes, then further review would address the remaining two questions:

3. If PATH is the best option, then does it really need to come so close to my home?
4. If it does then how can it be designed to minimize negative effects?

### **ABOUT THIS SUMMARY**

---

In October, 2009, testimony from five expert witnesses was submitted to the Virginia State Corporation Commission (SCC) regarding the PATH project. The testimony of four witnesses was submitted on behalf of the Sierra Club: Robert Fagan, Christopher James, George C. Loehr, and Dr. Hyde Merrill. Testimony from Professor Martin Blank was submitted on behalf of Alfred and Irene Ghiorzi. All five witnesses have many years of experience in their respective fields and are highly-respected among their peers.

This document presents a summary of the key facts and conclusions contained in the testimony provided by these witnesses. The original testimony was structured to conform to the rules of evidence under which the SCC operates. While this structure makes sense in a legal setting it can be difficult to comprehend by the layman.

This summary is an attempt to distill 450 pages of testimony and supporting documents in a way which makes it easier to understand the key facts and conclusions reached by the experts. Each fact-conclusion is followed by the last name of the expert then a page number in

parentheses. Clicking on the name will take you to the direct testimony provided by the witness where you can then scroll to the page where the fact or conclusion appears.<sup>3</sup> Following are links to this testimony if you are viewing a paper copy of this document:

Dr. Martin Blank: <http://ceds.org/PATHWV/VASCC/blank-testimony.pdf>

Robert Fagan: <http://ceds.org/PATHWV/VASCC/fagan-testimony.pdf>

Christopher James: <http://ceds.org/PATHWV/VASCC/james-testimony.pdf>

George C. Loehr: <http://ceds.org/PATHWV/VASCC/loehr-testimony.pdf>

Dr. Hyde Merrill: <http://ceds.org/PATHWV/VASCC/merrill-testimony.pdf>

Text contained in quotes is taken verbatim from the testimony. Where quotes are lacking the text reflects an interpretation of the testimony by the author who, while knowledgeable regarding the topics addressed in this summary, is by no means an expert. References to relevant testimony generally follows each interpretation. The reader is encouraged to verify the accuracy of these interpretations by consulting the original testimony. But first let's introduce the experts.

## **BACKGROUND OF THE EXPERTS**

---

Following is a summary of the background of each of the five experts.

**Dr. Martin Blank** is an Associate Professor in the Department of Physiology and Cellular Biophysics at Columbia University, College of Physicians and Surgeons, where he has been teaching and doing research for over 45 years. He has also served as a consultant on scientific matters related to his research on electromagnetic fields (EMF). Professor Blank has taught Medical Physiology to first year medical, dental and graduate students, including a year as Course Director in charge of 250 students. However, his primary responsibility has been to conduct research, and has specialized in the effects of EMF on cell biochemistry and cell membrane function. Dr. Blank's most recent research is on health related effects of EMF, primarily on stress protein synthesis and enzyme function. He has lectured on his research around the world.

In 2008, Dr. Blank was invited to address the Brazil Chamber of Deputies on biologically based EMF safety standards. In his career, he has had appointments at: Cambridge University (England); the Weizmann Institute, Ben Gurion University and Hebrew University in Israel; the University of California at Berkley; Monash University in Australia; the Institute of Electrochemistry in the former USSR; Warsaw University in Poland; the Tata Institute in India; the University of Victoria in Canada; and Kyoto University in Japan.

---

<sup>3</sup> The files containing the testimony of two witnesses, Robert Fagan and Christopher James, is rather large 3.0- and 4.5-MB respectively. The links provided below are to just the text of the Fagan and James testimony (less attachments) which reduced file size. The full testimony can be viewed by clicking the links provided on this page, above.

Professor Blank has also held industrial research positions at the California Research Corporation, Esso Research, at three Unilever Research (two labs in England; one in the Netherlands), as well government appointments at the U.S. Department of Defense, the Office of Naval Research (in London and Arlington, Va). He has organized many scientific meetings, including two World Congresses on Electricity and Magnetism in Biology and Medicine and four Erice (Italy) Courses on Bioelectrochemistry. Dr. Blank started the Gordon Research Conference on Bioelectrochemistry

Professor Blank has served as Chairman of the Organic and Biological Division of the Electrochemical Society, President of the Bioelectrochemical Society, and President of the Bioelectromagnetics Society. He has also served on the editorial boards of the Journal of the Electrochemical Society, Bioelectrochemistry, and Bicenergetics. Dr. Blank's publications include over 200 papers and reviews, as well as twelve edited books on electrical properties of biological systems, including the Proceedings of the First World Congress on *Electricity and Magnetism in Biology and Medicine* and *Electromagnetic Fields. Biological Interactions and Mechanisms*. Dr. Blank was one of the organizers of the Bioinitiative Report<sup>4</sup>, as well as a contributor, and he edited the August 2009 special issue on EMF of the peer-reviewed journal Pathophysiology.

Professor Blank's many research and teaching roles, as well as professional activities with scientific societies and journals, have given him a broad perspective on scientific research related to EMF safety issues. The online Bioinitiative Report<sup>5</sup> (2007) evaluating electromagnetic safety standards (to which he contributed a report on stress proteins) was cited by the European Parliament in their September 2008 decision to reconsider EMF safety standards. Finally, Dr. Blank recently edited a peer-reviewed update of the Bioinitiative Report in the scientific journal Pathophysiology.

**Robert Fagan** is a Senior Associate at Synapse Energy Economics in Cambridge, Massachusetts. Synapse clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government and utilities. Mr. Fagan holds a Master of Arts Degree from Boston University in Energy and Environmental Studies. He is an energy economics analyst and mechanical engineer with over 20 years of experience in the energy industry.

**Christopher James** is also a Senior Associate at Synapse Energy Economics. He has a Master of Arts Degree in Environmental Studies from Brown University. He served as the director of Air Planning for the Connecticut Department of Environmental Planning. Mr. James' recent clients include the Sierra Club, California Energy Commission, Maine Public Utilities Commission, the New Jersey Ratepayer Advocate, AARP, the National Association of Clean Air

---

<sup>4</sup> The Bioinitiative Report is available online at: <http://www.bioinitiative.org/>

<sup>5</sup> Ibid.

Agencies, Environmental Defense, EPA and the Regulatory Assistance Project (in which he is working with Chinese air quality officials to reduce the environmental impacts from coal-fired power plants).

**George C. Loehr** is the former Chairman of the Computer Committee, Federal Power Commission System Studies Group, Interconnected System. He also served as Division Engineer of Con Edison's Transmission Planning Division. Mr. Loehr joined the New York Power Authority (NYPA) as Chief Planning Engineer in 1969. He served as Executive Director of the Northeast Power Coordinating Council. At present, Mr. Loehr chairs the Executive Committee of the New York State [Electric] Reliability Council.

**Dr. Hyde Merrill** holds a doctorate in electrical engineering from MIT. He has been an independent consulting engineer since 1998. For the preceding 18 years, he worked as a consultant at Power Technologies, Inc., doing power system planning studies and developing tools for power system planning and operation. Dr. Merrill worked for American Electric Power Service Corporation for seven years after graduating from college. He has been an adjunct professor at Rensselaer Polytechnic Institute and a visiting assistant professor at MIT. Dr. Merrill was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for "contributions to decision analysis considering conflicting objectives and risk in electric power systems." He has published more than 80 technical papers and book chapters, including roughly two dozen on strategic planning in electric power.

Following is a summary the key facts and conclusions contained in the testimony of these five eminently qualified experts before the Virginia State Corporation Commission.

### **IS PATH NEEDED TO KEEP THE LIGHTS ON?**

The proponents of PATH claim it is critical to preventing blackouts and other problems. This claim is based primarily upon planning conducted by an organization known as PJM Interconnection. When it began PJM coordinated the flow of electricity from power plants to distribution companies serving a three-state area: Pennsylvania (P), New Jersey(J), and Maryland(M), hence the acronym. Now PJM is the Regional Transmission Organization (RTO)<sup>6</sup> for a population of 51 million in an area covering 13 states and Washington, D.C.<sup>7</sup>

Each year PJM produces a *Regional Transmission Expansion Plan* (RTEP) which "identifies transmission system upgrades and enhancements to provide for the operational, economic and reliability requirements of PJM customers." It is this plan which provides the primary justification for PATH. In other words, it is the RTEP which is claimed to show that

---

<sup>6</sup> Further detail on Regional Transmission Organizations can be found at: <http://www.ferc.gov/industries/electric/indus-act/rto.asp>

<sup>7</sup> A map showing the PJM service area and the area covered by the distribution companies can be viewed at: <http://www.pjm.com/about-pjm/how-we-operate/territory-served.aspx>

PATH is critical to keeping the lights on. As you will see the RTEP fails to comply with good planning principles. Also, there is ample reason to believe that other alternatives would be just as effective, perhaps more so, at a far lower cost in terms of:

- the amount each of us pays for electricity;
- impacts to our health and environment; and
- our overall quality of life.

At this point in time, the only “planning” conducted of the need to improve transmission lines is that carried out by PJM through the annual Regional Transmission Expansion Plans. Again, as will be seen below, the RTEP process falls far short of what is needed to answer one of the many critical questions regarding such a project: *Is the transmission line the best way to keep the lights on?* What we really need is an adequately funded, truly independent comprehensive energy planning process through which:

- our future energy needs are determined;
- all alternatives for meeting these needs are identified;
- each alternative is ranked with respect to a number of values (ratepayer cost, reliability, public health consequences, national security, environmental impact, etc.); then
- the alternatives with the highest ranking are recommended for preferential treatment.

If such a process showed that PATH was the highest ranking alternative, then public opposition would decline considerably. However, it is the lack of such a process, along with the perception that negative consequences greatly outweigh benefits, which is fueling the intense opposition to PATH. As will be seen in the remainder of this document, this widely held perception is supported by substantial fact. A comprehensive energy planning process may be the shortest route to determining if PATH could become our best option or if it should be abandoned once and for all.

### **PATH Need Justification Violated Good Planning Principles**

The standards for transmission line planning are established by the North American Electric Reliability Corporation (NERC)<sup>8</sup>. In this section testimony from two of the experts regarding the adherence of PATH planning to these principles is presented verbatim.

---

<sup>8</sup> For further detail on NERC visit: <http://www.nerc.com>

**PATH Assumptions Not Credible-Reasonable:** “The applicants and PJM do not have carte blanche from NERC. While PJM has been designated by NERC as a Planning Authority (a.k.a. Planning Coordinator since 2007) and Transmission Planner, it is not authorized to make whatever assumptions it wants when conducting planning studies. In my opinion, the assumptions and base conditions of the applicant’s and PJM’s studies are not credible and reasonable. Therefore, neither are the conclusions.” ([Loehr](#) p. 7-8)

“ The alleged violations [used to justify PATH] are based on the applicants’ initial assumptions, and in my [[Loehr](#)] view those are not reasonable. Why I believe that the procedures used in the PATH studies are not reasonable is covered in the remainder of my testimony. But the major objection I have is with what I consider an overly conservative process for determining the Capacity Emergency Transfer Objective (CETO)<sup>9</sup>, leading to an import target for the LDA<sup>10</sup> which is unnecessarily high. When the load flows are run to determine if there are any NERC violations, they use this import value; since it’s unnecessarily high, finding ‘violations’ is practically guaranteed. With a more reasonable import value, neither thermal nor voltage violations will be found.” ([Loehr](#) p. 22-23)

“While NERC Planning Standards call for the system to be stressed, the interpretation of ‘stress’ must be reasonable. PJM and the applicants take the concept of ‘stress’ to unreasonable extremes.” ([Loehr](#) p. 11)

“All of PJM’s load deliverability testing, which it relied on in determining the need for PATH, was based on a single dispatch. NERC standards call for multiple dispatch scenarios: according to a NERC interpretation of Standards TPL-002 and -003, “a variety of possible dispatches should be included in planning analyses.” ([Loehr](#) p. 10-11)

“In my [[Loehr](#)] opinion as an expert, the manner in which PJM and the applicants configured PJM system prior to the application of contingencies went considerably beyond what consider reasonable. If the base assumptions are not credible, then the contingency analyses based on them are not credible – even though the applied contingencies are those specified in the NERC standards. A house built on sand will not stand. The studies are built on sand; they’re based on assumptions, how the PJM system is represented, which are neither credible nor reasonable. Therefore, neither are the conclusions.” ([Loehr](#) p. 22)

“This bias or tendency toward ‘piecemeal,’ one-at-a-time transmission planning is a grave weakness of the current RTEP process in PJM.” ([Loehr](#) p. 37)

---

<sup>9</sup> Capacity Emergency Transfer Objective (CETO) is the amount of electricity that must be imported into an area experiencing an emergency predicted to occur once in 25 years.

<sup>10</sup> An LDA is a Load Delivery Area. Examples of LDAs include the area served by Dominion,

**PATH Assumptions Too Conservative:** “In my [Loehr] opinion, NERC violations have not been established since the base case assumptions are too conservative. So, too, are the CETO/Load Deliverability procedures.” (Loehr p. 10) “PJM’s procedure for establishing CETO values is far more conservative than other eastern ISO/RTOs. It’s ultra-conservative when compared to New York and New England.” (Loehr p. 10)

**PATH Planning Violates FERC Fair & Nondiscriminatory Principle:** “PJM planning studies represent future generators which have executed only a Facilities Study Agreement (FSA) if they add to a reliability problem, but require the next step, an Interconnection Services Agreement (ISA), if they contribute to a solution. This is a clear case of bias, and violates FERC’s ‘fair and non-discriminatory’ principle. More important, it does not make engineering sense.” (Loehr p. 9)

**Problems Justifying PATH Not Proven:** “The alleged ‘voltage stability’ problems have not been proven. We’ve been shown ‘knee-of-the-curve’ results from steady state load flows, but no actual time-domain stability results. The alleged voltage violations are also based on the unnecessarily high CETO values. At more realistic CETO, there would be no violations.” (Loehr p. 11) “In addition, it is unclear that any capacitors<sup>11</sup> would be needed in the absence of the PATH line. The alleged voltage issues identified in the April 2009 Study are apparently due to undocumented and unjustified changes from the 2008 RTEP planning assumptions, at least some of which appear erroneous. Correcting these changes should resolve most or all of the claimed voltage violations. Finally, using reasonable “CETO” values and accounting for demand side management (“DSM”) resources that have cleared the latest RPM auction will further help to resolve or eliminate the alleged voltage issues.” (Merrill p. 4)

**PATH Effects on Reliability Unproven:** “PJM’s planning studies do not justify the PATH line. The vast majority of alleged reliability issues that are presented in support of the PATH line are not based on any modeling or contingency analyses as NERC requires. None of the alleged violations is based on reasonable assumptions regarding the need for power transfer from western to eastern PJM.” (Merrill p. 3)

“In addition to the total absence of reliability analyses after 2014, the April 2009 and 2008 RTEP studies cannot demonstrate a need for the PATH project because they ignore key generation and DSM resources in eastern PJM. For example, the RTEP studies failed to include a large power plant<sup>12</sup> with a completed ISA (interconnected service agreement). This is a violation of PJM’s published planning standards, which require such plants to be modeled. This plant will push claimed 500-kV thermal violations beginning in 2016 further into the future. In addition,

---

<sup>11</sup> “Capacitor: A device that maintains or increases voltage in power lines and improves efficiency of the system by compensating for inductive losses” according to *Electricity Transmission: A Primer* available at: <http://www.raponline.org/Pubs/ELECTRICITYTRANSMISSION.pdf>

<sup>12</sup> This power plant is the 1600 MW third reactor at Calvert Cliffs.

recognizing the demand-management resources called forth in the 2009 RPM auction will push claimed violations even further into the future.” (Merrill p. 5)

“Fundamentally, there is no longer any basis to suggest that PATH is needed in light of alleged imminent reliability violations. Given the significant changes in PJM’s analysis between 2007 and 2009, it is unreasonable not to consider far more modest alternatives to building a new 765-kV power line. Yet, despite these significant changes, PJM has not considered any alternatives since 2007 and has never considered any of the potential fixes I identify in my testimony. This is not only bad transmission planning, but as Mr. Loehr’s testimony points out, it is a risky strategy that will decrease reliability on the overall system by making eastern PJM more dependent on power from distant generators in western PJM.” (Merrill p. 5-6)

“In addition, Mr. Loehr observes that the tests used to diagnose the events in Exhibit PFM-20 are screening tests and should be followed up by stability studies, which apparently were not done. Mr. Loehr is one of the world’s most experienced and thoughtful experts on power system reliability. His opinions in this area merit very serious attention.” (Merrill p. 8)

“No matter what changes in the 500-kv system PJM has predicted, PATH is always asserted to solve all alleged problems. Any line that solves all possible issues far out into the future is either over-designed or poorly analyzed.” (Merrill p. 21)

“PJM projections of alleged 500-kv line overloads are unstable. The first year of claimed overloads moved from 2019 in 2006 to 2012 in 2007 and then receded by a year from 2007 to 2008 and by three years in April 2009. But PJM fails to demonstrate that the alleged 500kv issues are credible and that there are no more modest, less intrusive, and more cost-effective solutions to solve them.” (Merrill p. 26)

### **PATH Need Based On Highly Unreliable Extrapolation**

“In the April 2009 study, the alleged overloads past the fifth year (e.g., years 2015-2024) are not supported by any kind of contingency analysis, as described in the NERC standards, or by the deliverability analyses that PJM performs. The alleged overloads are based purely on extrapolated flows from 2014 and a linear analysis using distribution factors. ***Extrapolation rather than detailed modeled is notoriously inaccurate. A \$1.8 billion line should not be based on such a flimsy foundation.*** [emphasis added]” (Merrill p. 21)

“I [Merrill] do a lot of work with related problems and have published extensively in this area. As part of one study we took 50 data points and estimated the values of others, whose values we actually knew because this was an experiment. (Mukerji et al, ‘Creating Data Bases for Power System Planning Using High Order Linear Interpolation,’ IEEE Transactions on Power Systems, Vol. 3, No. 4, November 1988). Four were outside the range that permitted interpolation. We extrapolated for them using a sophisticated approach. ***The average extrapolation error was 25.7%.*** [emphasis added]” (Merrill p. 27)

“Exhibit PFM-2<sup>13</sup> is the basis for establishing the need for PATH as far as the alleged 500-kV thermal violations are concerned. The reliability analysis that underlies PFM-2 was not performed beyond 2014. All results beyond 2014 are extrapolated. Extrapolation is neither reliable nor acceptable, particularly for a \$1.8 billion project.” ([Merrill](#) p. 27)

### **PATH Need Assessment Ignored Demand Side Resources**

“However, in analyzing load growth and resource availability in the region, PJM:

- I. Fully excludes 2,908 MW of PJM-approved demand-side resources in the Mid-Atlantic region (more than 5% of the 2009 Mid-Atlantic peak load<sup>3</sup>), and 371 MW in the Dominion (Virginia) zone, available beginning in 2012 and already secured as a resource by PJM through its May 2009 capacity procurement process known as ‘RPM’ (reliability pricing model). Demand-side resources are a FERC and PJM-approved capacity resource, yet due to the timing of PJM’s most recent capacity procurement (May, 2009), ***the largest increase of such resource availability in PJM’s history has not been considered in the PATH technical analyses*** (the latest of which were undertaken in March and April of 2009, just before the capacity procurement results were known). [emphasis added]” ([Fagan](#) p. 3)

“In addition to the total absence of reliability analyses after 2014, the April 2009 and 2008 RTEP studies cannot demonstrate a need for the PATH project because they ignore key generation and DSM [Demand Side Management] resources in eastern PJM. For example, the RTEP studies failed to include a large power plant<sup>14</sup> with a completed ISA (interconnected service agreement). This is a violation of PJM’s published planning standards, which require such plants to be modeled. This plant will push claimed 500-kV thermal violations beginning in 2016 further into the future. In addition, recognizing the demand-management resources called forth in the 2009 RPM auction will push claimed violations even further into the future.” ([Merrill](#) p. 5)

“Generation assumptions are equally flawed. For instance, PJM claims that it incorporates in its analyses all generation with a signed ISA. However, it omitted from its studies a proposed 1640-MW generator at Calvert Cliffs, with a first-quarter 2016 in-service date. This generator has not only a signed ISA but also a signed CSA, which is one step further in the interconnection process. This generator would reduce the Mid-Atlantic LDA CETO value. It would also reduce the actual imports into that area. These changes would reduce any alleged overloads beyond 2015. By themselves, these changes would likely postpone the years when the extrapolated loading is alleged to first exceed 100%.” ([Merrill](#) p. 22)

---

<sup>13</sup> Exhibit PFM-2, is entitled "Thermal Violations of NERC Reliability Standards Identified in April 2009 Study," and can be viewed on the Virginia State Corporation Commission website under Case No. PUE-2009-00043: <http://docket.scc.virginia.gov/vaproduct/main.asp>

<sup>14</sup> This power plant is the 1640 MW third reactor at Calvert Cliffs.

“I [Merrill] understand that no nuclear plants have been ordered in the U.S. for thirty years and that the new Calvert Cliffs unit is not certain to be in service in 2016. However, the signed ISA and CSA indicate that this is a serious project. Further, my point is that PJM’s analysis violated PJM’s own protocols. It failed to account for new generation in the LDA of concern that satisfies PJM’s criteria for inclusion and that is reasonably certain to materialize.” ([Merrill](#) p. 32)

### **PATH Need Assessment Ignored Energy Efficiency Resources**

“However, in analyzing load growth and resource availability in the region, PJM:

- ii. Does not consider more than 2,000 MW (by 2015) of peak-load-reducing energy efficiency and demand response resources under development through electric utility programmatic efforts and other vehicles (pursuant to state law or policy) in all the PJM Mid-Atlantic states, the District of Columbia and Virginia. These resources are in addition to the 2,908 MW of excluded Mid-Atlantic demand-side resources noted above; and” ([Fagan](#) p. 4)

“I also understand that the 2009 RPM auction cleared 717 MW more in the BGE (Baltimore Gas & Electric) area than did the 2008 auction, and 316 MW in PEPCO and that these additional DSM resources have never been considered.” ([Merrill](#) p. 33)

“Considering both the Calvert Cliffs unit and the EE and DR, the loading on the line will not exceed 100% until 2024.” ([Merrill](#) p. 33)

### **PATH Need Based on Outdated Peak-Load Forecasts**

“However, in analyzing load growth and resource availability in the region, PJM:

- iii. Uses an outdated peak load forecast released in January 2009 that uses fourth quarter 2008 data, during a time of one of the largest economic downturns in US history. The economic downturn has led to dramatically reduced electricity use in the region, and by PJM’s own reckoning the 2009 summer coincident peak load in the Mid-Atlantic region of PJM was 3.4% lower than PJM’s forecast peak for the Mid-Atlantic region from the January 2009 PJM Load Report.” ([Fagan](#) p. 4)

“PJM bases its current assessment on a load forecast prepared in December 2008 based on data available in the last quarter of 2008. By PJM’s own reckoning, these data are outdated and contain too high an estimate of peak load growth.” ([Fagan](#) p. 6)

“This means that the CETO number that was used as the basis for all of PJM’s testing in the April 2009 study was too high, and the results are therefore not credible on that basis alone. The recent revision in CETO is significant, and more reasonable CETO assumptions would be even more significant. Some of the reported 2014 violations may no longer occur.” ([Merrill](#) p. 17)

“I [Merrill] reiterate that some or all of the supposed 2014 thermal violations may disappear if the recently revised CETO number is used, and especially if a lower value as recommended by Mr. Loehr is used, or if the load reductions covered in Mr. Fagan’s testimony are modeled.” ([Merrill](#) p. 19)

“In relying on the 2014 base case to project overloads in 2015-2024, PJM fails to account for new generation that meets PJM’s own criteria for inclusion in analysis. PJM claims to include all new generation with signed ISA, but it does not do so.” ([Merrill](#) p. 30)

### **PATH Not Needed To Import Power To Mid-Atlantic**

“PATH is more about economics than reliability. When added to the present import capability in excess of 6,000MW, there is more than enough generating capacity within the constrained Mid-Atlantic LDA to supply all the load all the time.” ([Loehr](#) p. 40)

“*For the Mid-Atlantic LDA, without PATH, a 6,000 MW CETO would result in zero violations. Zero.* And the Mid-Atlantic area would still be capable of importing over 6,000MW. [emphasis added]” ([Loehr](#) p. 28)

“Without PATH, the capability of the Mid-Atlantic LDA to import power would still be in excess of 6,000 MW. In other words, with a 6,000 MW transfer into the Mid-Atlantic area, *there would be no reliability violations. Not one.* [emphasis added]” ([Loehr](#) p. 10)

### **Current Demand Resources & Energy Efficiency Postpones Need for PATH 4-8 Years**

“My [Fagan] testimony here will first provide summary background information on facets of the PJM electric market structure that is relative to the issues I address. I then proceed to demonstrate the following:

1. Using current data on DR and EE resource availability, the ‘net peak load’ PJM projects in its PATH analysis for 2014 for the Mid-Atlantic region will not be seen until 2018.”
2. Using current data on DR and EE resource availability and incorporating the additional effect of state-level DR and EE initiatives, the ‘net peak load’ PJM projects in its PATH analysis for 2014 for the Mid-Atlantic region will not be seen until 2021.
3. Including an adjusted load forecast in addition to the DR and EE resource additions noted above shifts PJM’s net peak load from 2014 to at least 2022.” ([Fagan](#) p. 6)

### **PJM Projections Cannot Be Verified**

“Question: Can the extrapolated results presented in exhibit PFM-2, be independently verified?”

Answer: Nobody, including the Commission staff, can replicate or verify them. Doing so would require four sets of numbers.

1. The flows on each monitored line. PJM did not retain the individual runs on which each 2014 number is based.
2. The projected loads for each area. PJM retained these and made them available.
3. The projected generation for each area. PJM did not retain this information.
4. The distribution factors (DFAX). PJM did not retain this information.

In other words, Exhibit PFM-2, which for alleged 500-kV thermal violations is the basis for establishing the need for the PATH project, cannot be replicated or audited independently. The Commission cannot look under the hood. PJM did provide descriptions of how the 2014 flows, the projected generation, and the DFAX were calculated. These were not sufficiently unambiguous to permit a skilled planner to replicate their work.” ([Merrill](#) p. 29)

#### **PATH Alternatives Not Given Reasonable Consideration**

“Furthermore, PJM fails to explore any alternative solutions to the alleged reliability concerns that consider the use of either demand-side resources or generation supply located in the Mid-Atlantic region. PJM does no modeling of the effect on PATH purported need of reducing the ‘net peak load’<sup>15</sup> (i.e., the forecast peak load net of demand-side resources) seen on the grid. Instead, PJM proposes PATH as a solution to a peaking problem. The actual duration of the highest peak loads seen in summer in the Mid-Atlantic region is limited to relatively brief periods of time.” ([Fagan](#) p. 4)

“The applicants seem focused almost exclusively on AC EHV transmission. Non-transmission alternatives, and even other transmission alternatives like HVDC, have been ignored.” ([Loehr](#) p. 9)

“Other than construction of the 765kV PATH line, solutions to the alleged steady state voltage violations have not been addressed. Apparently, neither power factor improvements by adding capacitors at the distribution and subtransmission level, nor shunt capacitors at 115/138kV substations, have been considered.” ([Loehr](#) p. 11-12)

“Despite the fact that the latest ‘re-tool’ analyses show different violations occurring on lower voltage facilities in a time-frame further out in the future, no alternatives to PATH as originally proposed have been examined.” ([Loehr](#) p. 12)

---

<sup>15</sup> Reliability problems are most likely to occur during periods of maximum (peak) electricity uses, such as a hot summer afternoon when air-conditioning is at the highest setting.

“The testimony of the applicants’ witnesses indicates that the only alternatives seriously considered during the 2007 RTEP were other AC EHV<sup>16</sup> transmission lines. No alternatives involving non-transmission resources (generation, additional DSM<sup>17</sup>, etc.) in the East, close to the load centers, were examined, even though they might offer distinct advantages in terms of cost, reliability, and environmental impact. Little recognition seems to have been paid to PJM’s Reliability Pricing Model (RPM) process – despite the fact that one of its stated purposes is to provide incentives for generators to locate near the eastern load centers. PJM argues that it is not permitted to order anything other than transmission – but it certainly could develop policies that would encourage non-transmission solutions. Eastern resources seem to rate second-class status as compared to AC EHV transmission. No attention was even paid to transmission alternatives other than alternating current (AC) 500 and 765kV. High Voltage Direct Current (HVDC) alternatives were totally ignored in 2007 – despite HVDC’s obvious advantages, and its utilization for other projects in PJM (e.g. Neptune and MAPP<sup>18</sup>). PJM’s planning process seems to be wearing blinders – any alleged reliability problems will be addressed by the ‘same old same old’ EHV transmission solutions.” ([Loehr](#) p. 35)

“PJM and the applicants demonstrate a distinctly ‘one track mind’ in their planning. Alternatives involving means other than an AC EHV transmission line have not been explored – this is true despite the fact that the problems discovered in the 2009 analyses depict dramatically different limiting facilities than those uncovered in 2008. In fact, the 2009 ‘re-tool’ cases came up with a very different set of problems, were less severe, and occurred further out in the future. To most planning engineers, this would suggest that other possible solutions should be examined, but no such attempt has been made. This is especially true if the conclusions are the result of extrapolation. The original PATH proposal remains unchanged, and alternatives remain unexamined.” ([Loehr](#) p. 44)

“There’s a built-in bias against any other approach; e.g. the way representation of new generators is handled strongly discourages serious consideration of non-transmission alternatives. Even in the area of transmission itself, no alternatives other than 500 and 765kV AC have been examined. A strong case can be made that no additional transmission is needed. But even if additional transmission is needed, why hasn’t PJM considered building PATH as, for example, an HVDC line? Or why hasn’t the conversion of an existing AC line (such as the Mt. Storm-Doubs 500kV line, as suggested by Mr. [Dr.] Merrill) been considered?” ([Loehr](#) p. 44-45)

---

<sup>16</sup> EHV = Extra-High Voltage.

<sup>17</sup> DSM or Demand Side Management consists of measures to reduce electric use during peak periods. For example, major industries would receive financial incentives to reduce electricity use on hot summer afternoons.

<sup>18</sup> MAPP = Mid-Atlantic Power Pathway proposed to run from Possum Point, VA through Southern Maryland and the Delmarva peninsula. Neptune is a project in New Jersey and New York in which a portion of the line was buried beneath estuarine and ocean waters.

“In any case, voltage issues on the scale of the alleged violations presented by PJM can and should be resolved by installing new capacitors, not by building a new 765-kv power line. PJM claims that a conventional remedy, compensation with capacitors, is impractical due to the ‘sheer number’ and cost of about 2,000 Mvar of capacitors that PJM says would solve the alleged voltage problems. PJM also claims that capacitive compensation will make the system harder to operate. These objections are invalid. Again, PJM proposes to install 1,750 Mvar of capacitors as part of the PATH project. Building the PATH line will not avoid installing the capacitors that PJM claims are an ‘infeasible’ alternative.” ([Merrill](#) p. 4)

“Approximately the same number of capacitors are needed, according to PJM, with or without the PATH line. The supposed voltage problems can be solved with capacitors and without the line, according to PJM. Or they can be solved with about the same number of capacitors and with the line. So as far as the supposed voltage problems are concerned, the line itself isn’t the solution.” ([Merrill](#) p. 11-12)

“Fundamentally, there is no longer any basis to suggest that PATH is needed in light of alleged imminent reliability violations. Given the significant changes in PJM’s analysis between 2007 and 2009, it is unreasonable not to consider far more modest alternatives to building a new 765-kV power line. Yet, despite these significant changes, PJM has not considered any alternatives since 2007 and has never considered any of the potential fixes I [[Merrill](#)] identify in my testimony. This is not only bad transmission planning, but as Mr. Loehr’s testimony points out, it is a risky strategy that will decrease reliability on the overall system by making eastern PJM more dependent on power from distant generators in western PJM.” ([Merrill](#) p. 5-6)

“In short, PJM has made no effort to consider basic fixes for the few 2014 violations that it is alleging in support of PATH.” ([Merrill](#) p. 17)

“Mr. McGlynn<sup>19</sup> says that the sudden emergence of alleged widespread voltage problems in 2014 can be cured by about 2,000 MVAR of reactive power. I conclude that if he is right, the alleged voltage collapse that is projected in 2014 can be attributed in part to growth of reactive demand in the East, most of which appears to be erroneous. It can also be attributed to the removal of two capacitors from the April 2009 case, which appears to be undocumented and unnecessary given that it causes a problem. Finally, it appears that three transmission circuits that were generating a significant amount of reactive power in the 2008 RTEP case have been removed from the April 2009 case.” ([Merrill](#) p. 11)

### **Alleged Violations Used To Justify PATH Can Be Solved Better With Alternatives**

“The six 230-kV and 345-kV [transmission line] thermal violations alleged to occur in 2014, and identified for the first time in the April 2009 study, are minor. They can be resolved at relatively

---

<sup>19</sup> Paul F. McGlynn is a consultant retained by the applicant to prepare testimony in support of the need for the PATH transmission line project.

low cost with relatively little environmental impact. By themselves, they do not justify a 765-kV line.” ([Merrill](#) p. 4-5)

“The 500-kV thermal violations that PJM has used to justify the PATH line since it was approved in 2007 continue to recede into the future. In the April 2009 study, these alleged violations are not even justified by a ‘NERC criteria’ analyses. They are based wholly on extrapolated data, with no contingency or deliverability analyses performed for any years past 2014.” ([Merrill](#) p. 5)

“A \$1.8 billion dollar line should be supported by actual reliability analyses, not extrapolated data.” ([Merrill](#) p. 5)

“These alleged problems are associated with the lower-voltage system. PJM resolves many such problems every year without building 765-kV lines. It is not reasonable to build a 765-kV line to resolve issues that can be addressed with routine fixes that are far less costly, far less intrusive, and in some cases, more effective than the proposed PATH line. PATH is overkill as a solution for four of these six purported issues. According to PJM, PATH is only a temporary fix for the other two.” ([Merrill](#) p. 15)

Whatever the respective limiting factors on these lines, there are alternative solutions to PATH that should be considered to resolve supposed overloads, including replacing relatively inexpensive items of equipment or fixing the clearance under a single span. More expensive solutions could include reconductoring or building a new line. PJM has not considered any alternative fixes for these issues, other than the PATH line.” ([Merrill](#) p. 16)

### **Costs of PATH Not Compared With Alternatives**

“PJM undertakes neither a direct nor a comparative economic analysis of the PATH line or feasible alternatives. PJM did not quantify the DR [Demand Resources] and EE [Energy Efficiency] resources that would defer or eliminate the need for PATH. PJM limits its inclusion of future Mid-Atlantic area generation resources to approximately one-tenth the level of generation that has indicated interest in connecting to the grid in the Mid-Atlantic region. PJM does not conduct sensitivity analyses of the how the grid might be effected if such generation were to come online in future years (2014 and beyond).” ([Fagan](#) p. 5)

“Reasonable alternatives, both non-transmission and even transmission, were not considered despite their potential advantages in terms of cost, reliability, and environmental impact. The applicants did not consider any reasonable alternatives based on the currently identified (April 2009) issues.” ([Loehr](#) p. 46-47)

“PJM’s claimed vulnerability to widespread voltage collapse was identified for the first time in April 2009, long after the line had been approved based on alleged 500-kV thermal violations. Now, PJM maintains that PATH is required to prevent alleged voltage collapse. However, PJM

has admitted that installing 2,000 Mvars of capacitors would eliminate these voltage issues. And Company witnesses have admitted that the PATH project itself entails installation of 1,750 Mvars worth of new capacitors. In other words, PJM has identified a need to install new capacitors with or without the PATH line in service. So why not install PJM’s 2,000 Mvars of capacitors, costing \$40 million, instead of the planned-for 1,750 Mvar and the \$1.8 billion PATH 3 project?” ([Merrill](#) p. 3-4)

“In fact, PJM plans to install almost as many capacitors as part of the PATH line as they say would be needed to resolve the claimed voltage problems without building the line.” ([Merrill](#) p. 7)

### **Examples of the Better Alternatives To PATH Good Planning Might Reveal**

“Whereas the rest of the industry utilizes a loss of load expectation of one day in 10 years, PJM uses one day in 25 years to determine the import capability required by each Load Deliverability Area (LDA) – which can be quite large. Without this overly conservative approach, CETO values would be lower and there would be no NERC violations. Hence there is no demonstrated need for PATH.” ([Loehr](#) p. 46)

“For example, just by changing from a criterion of one day in 25 years to one day in 10 years for the Mid-Atlantic LDA, and putting it on the same loss of load expectation basis as New York and New England, PJM could lower the CETO [power transfer need] for the Mid-Atlantic LDA by approximately 3,000 MW.” ([Loehr](#) p. 26)

“In fact, PJM’s process for addressing reliability ‘need’ is far more conservative than necessary. In an earlier case (the proposed Prexy facilities in southwestern Pennsylvania), this overly conservative approach led to a recommendation for a major new 500kV transmission line, which was approved by PJM. In my opinion, such a high voltage facility was clearly unnecessary, and I [Loehr] testified to this during the proceedings. After the state hearings were mostly concluded, the PUC<sup>20</sup> ordered a voluntary collaborative effort. ***This led to a much simpler, less expensive, and less environmentally intrusive solution involving modifications to the local 138kV system and the addition of shunt capacitors.*** [emphasis added]” ([Loehr](#) p. 26-27)

“After the collaborative process, the approved fix reinforced the electric grid without any new 500 kV lines, substations, or 138 kV lines. Instead, it involved installing one new monopole on an existing utility right of way (to allow the connection of two existing lines), adding equipment (capacitors) at five existing substations, and replacing the conductors on 2.5 miles of existing 138 kV lines. The estimated cost for the agreed-upon fix is \$11.6 million, instead of \$213 million for the proposed Prexy Facilities [500 kV transmission line]. And the solution solved the same reliability issues that were ‘driving the need’ for the previously proposed ‘Prexy Facilities.’” ([Loehr](#) p. 27)

---

<sup>20</sup> Pennsylvania Public Utility Commission

## **PATH Will Decrease Reliability of Electric Service**

“PATH would not improve reliability. Rather, by making eastern load centers all the way from northern New Jersey to northern Virginia more dependent on remote generation and transmission lines hundreds of miles in length, PATH would *exacerbate reliability*. [emphasis added]” ([Loehr](#) p. 8)

“PATH isn’t really about reliability – it’s about economics. While western generators would earn greater profits, eastern load centers would become more dependent on long EHV transmission lines; thus major East Coast cities like Philadelphia, Baltimore, Washington and Richmond would become more vulnerable to interruptions and blackouts, either from natural phenomena or from terrorist attacks.” ([Loehr](#) p. 11)

“The PATH ‘solution’ is not consistent with the alleged need to improve reliability. To improve reliability, PJM needs to promote the location of generation and other resources close to the load centers, rather than build a transmission line which will provide an incentive for the construction of generation, probably coal-fired, hundreds of miles away.” ([Loehr](#) p. 12)

“The real reliability problem in PJM is the present high dependence of the eastern load centers on remote generation and multiple EHV transmission lines, each hundreds of miles long. This is the problem PJM should be addressing; instead, PJM is pursuing policies which will make the problem worse.” ([Loehr](#) p. 12)

“In my [[Loehr](#)] opinion, PJM faces a reliability problem – a serious reliability problem – which will worsen if PATH is built. It’s the over dependence of the eastern PJM load centers on generating units hundreds of miles to the west. The megalopolis from northern New Jersey to northern Virginia is over-dependent on long transmission lines, any one of which could be taken out of service by natural or human agents. This is a major problem that needs to be addressed. And it’s a national security problem as well. PJM should, in my opinion, develop a program to address this problem as soon as possible – but instead PJM is pursuing policies that will only make the problem worse.” ([Loehr](#) p. 28-29)

“Rather than increase reliability, PATH would actually make it worse. Eastern load centers from Boston to northern Virginia comprise what urban planners sometimes call a linear city or megalopolis. It’s essentially one continuous metropolitan area. Within this linear city, the area from northern New Jersey and Philadelphia to Washington and northern Virginia is part of PJM. If PATH is approved, generating companies will be given a powerful incentive to site new generators in the Allegheny coal fields, hundreds of miles to the west, rather than in or close to the eastern load centers. Even existing coal-fired generators will have the opportunity to ramp up their outputs. This will make the eastern megalopolis even more dependent on remote generation resources than it already is. Cities like Newark, Philadelphia, Wilmington, Baltimore, Washington and Richmond will depend for their electric supply on generators hundreds of miles away. I’ve been in electric power transmission planning and reliability for more than 47 years,

but you don't have to be an engineer to understand that this is a less reliable situation than if the resources were located nearby. It's like running an extension cord down the block to plug your toaster into a neighbor's outlet rather than using an outlet in your own kitchen. The long transmission lines are vulnerable to all sorts of interruptions – including terrorist attack – so this is a national security issue as well as a reliability concern.” ([Loehr](#) p. 29)

“To me [Loehr], an egregious example of PJM's discrimination is how the representation of planned, future generators is handled. In its planning studies, PJM represents only those generators which have executed a Facilities Study Agreement (FSA). To be represented in the studies, generators which would contribute toward the solution of a reliability problem must also have executed an Interconnection Services Agreement (ISA), the next step after the FSA. However, generators which exacerbate a reliability problem are represented even if they have not received an ISA. This is patently discriminatory, and in my view is a direct violation of FERC's “fair and non-discriminatory” principle. In defense of this procedure, Mr. McGlynn testifies that more than 75% of all proposed generators eventually drop out, but adds that “5% of requests drop out after an FSA is executed.” [McGlynn, page 13, line 2] Mr. McGlynn testifies that only 5% of requests drop out between the execution of an FSA and an ISA. By McGlynn's own admission, there's very little difference between the number of generators that complete FSAs and those that complete ISAs – a mere 5%.” ([Loehr](#) p. 33-34)

“In my [Loehr] opinion, no distinction should be made. Any generator which has an executed FSA should be represented, regardless of whether it exacerbates or solves reliability problems. To intentionally discriminate against the very generators which could solve reliability problems is both foolish and potentially costly. It goes against one of the most important principles of FERC and deregulation – that all generators must be treated in a manner that is both fair and non-discriminatory. Finally, again in my opinion, it represents very poor engineering. Good engineering is premised on even-handedness – PJM's biased handling of future generators, based on whether each would contribute to a problem or its solution, tilts the science toward a presumably desired conclusion which might not be proven by a fair and non-discriminatory approach. This constitutes a bias towards transmission and in favor of western coal-fired generators and against eastern generators and other resources; it is not even-handed at all. Political and economic motives should not be permitted to interfere in the engineering. As I say in my courses, ‘When the Laws of Physics and the Laws of Economics collide, Physics wins.’” ([Loehr](#) p. 34-35)

“The more Philadelphia, Baltimore, Washington and Richmond must depend on long distance transmission, the more vulnerable they will be. And lower reliability is an inescapable consequence of greater vulnerability.” ([Loehr](#) p. 38)

“This would involve operating more expensive, local generation more frequently; however, reliability would be enhanced, since the Mid-Atlantic LDA would be less dependent on generating capacity hundreds of miles away.” ([Loehr](#) p. 40)

“In contrast, approving this line will lead to increasing reliance by the East Coast on remote coal-fired power plants with continuing or increasing transmission congestion, transmission losses, and a greater risk of cascading blackouts.” ([Merrill](#) p. 3)

“When systems build more transmission only to accommodate higher levels of transfer, they push the system harder. The likelihood of instability is increased; the system is more likely to suffer a blackout if an unforeseen contingency occurs, and the blackout is likely to be larger and more damaging. In my [Loehr] opinion, PJM has not proven a reliability problem that requires the construction of PATH, or that PATH will make the overall system more reliable. However, instead of building the PATH line, reliability could be improved by promoting additional generating capacity and other resources in the East, close to the load centers. Lower west-to-east transfers across the PJM system would significantly reduce the angle between generators, making the northeast quadrant of the Eastern interconnection less susceptible to instability and blackouts.” ([Loehr](#) p. 31)

“Blackouts are usually caused by contingencies more severe than those specified in the applicable standards or criteria, by equipment failures, control system problems, human error, or some combination of these. They involve the break-up of the bulk power transmission system. *Blackouts are not caused by shortages of generating capacity.* [emphasis added]” ([Loehr](#) p. 15)

“By increasing the amount of west-to-east transmission in PJM, the proposed PATH line would make the *Eastern Interconnection subject to larger blackouts.* [emphasis added]” ([Loehr](#) p. 30)

### **PATH Provides Western Electric Generators Free Access To Eastern Markets**

“PATH would effectively provide a subsidy to existing and future western generators – access to the lucrative eastern load centers without cost to themselves. Conversely, the western subsidies would place eastern generators at a significant disadvantage. This is a clear violation of FERC’s ‘fair and non-discriminatory’ principle.” ([Loehr](#) p. 8)

“PATH would encourage remote rather than local generation by providing western generators with free transmission access to eastern load centers. Existing coal-fired generators would be ramped up, and new coal-fired generators would be encouraged to site in the west.” ([Loehr](#) p. 8)

“PATH would discriminate against eastern generation and other potential resources, and promote western generation, by providing the latter with free access to eastern load centers – *all at the expense of the rate-payers.* [emphasis added]” ([Loehr](#) p. 46)

### **Problems Could be Resolved With Alternatives Far Less Costly Than PATH**

“The PATH purported need is driven by extreme peak load levels that, if they do occur, occur for only a very small fraction of summer periods. For example, the PJM Mid-Atlantic region summer 2008 peak load of 59,653 MW occurred for just one hour; and the ‘top 50’ hours of peak

loading (over the course of 10 different days in the summer of 2008) make up the last increment of 7,540 MW of peak load. Thus, the last 13% of the peak load level was seen for less than 1% of the time in 2008. This pattern holds for all recent years (2006 through 2008), and represents the nature of a summer peaking system. ***PATH is a \$1.85 billion interregional transmission project being proposed as a solution to a subregional ‘peaking’ problem.*** The peaking need requirement could met with less expensive eastern MAAC/southwestern MAAC demand-side resources or generation, but an examination is required to determine this – and PJM has not analyzed this possibility. That PJM states its hands are tied with respect to demand side and generation ‘market’ solutions does not validate their assertion of need for transmission, it just illustrates the lack of analysis of alternative solutions. [emphasis added]” ([Fagan](#) p. 7)

“PJM has not conducted any comprehensive economic analysis of the proposed PATH line. PJM provides no current estimate of the annual congestion or line loss savings associated with the project. PJM does not prepare any benefit/cost assessment, or attempt to illustrate savings that may contribute towards offsetting the annual revenue requirement of \$365 million that will be imposed on PJM consumers if the line is built. PJM has not prepared any assessment of comparable net costs of solutions such as peaking generation or additional demand response or energy efficiency. Earlier ‘market efficiency’ analyses conducted by PJM show savings to load of only \$47 million per year, thus the only information available on the potential economic benefits illustrates order-of-magnitude higher costs than benefits.” ([Fagan](#) p. 7-8)

“Claimed overloads on six lower-voltage facilities were diagnosed for the first time in April 2009. Such problems are routinely resolved on the lower-voltage system, at much lower cost than building a \$1.6 billion line. PJM analyzed no alternatives to the PATH line for addressing these issues.” ([Merrill](#) p. 37)

“Claimed overloads on 500-kV transmission lines were identified in 2007 (forecast to potentially arise in 2012) and 2008 (beginning one year later, in 2013). In the April 2009 study, they are claimed to show up two or three years later, beginning in 2015 or 2016. However, no contingency or other reliability analyses, or detailed modeling, were done for any year after 2014 – the first year that PATH is allegedly ‘needed’. Instead, the conclusions are based wholly on extrapolation from 2014 studies – an inherently unreliable technique. The studies also failed to include a proposed 1,640 MW [Calvert Cliffs] unit with an executed ISA, in violation of PJM’s oft-stated planning standards. Including this unit, and updating DSM resources to reflect the results of the 2009 RPM auction, will significantly reduce the flows on the supposedly overloaded lines. Using the updated CETO target will further reduce flows on these lines. Finally, the problems diagnosed in the April 2009 study were radically different from those identified in earlier studies. With the exception of superficial ‘analyses’ of capacitors to resolve the alleged voltage issues, no alternatives to the PATH line have been evaluated in the context of this new set of alleged problems.” ([Merrill](#) p. 37)

## **PJM RTEP PLANNING HAS A VERY NARROW FOCUS**

The only issue examined to any significant degree during the development of the annual PJM Regional Transmission Expansion Plans (RTEP) is reliability. While maintaining the reliability of electric service is critical, it is also one of a number of important factors. These factors include cost to ratepayers, greenhouse gas emissions and climate change, national security, public health, and siting impacts to name but a few.

In filings to the Virginia SCC, the 2008 RTEP was used to justify the PATH project. Dr. Merrill included a table in his testimony ([Merrill](#) p. 35) showing how often selected keywords appeared in the 2008 RTEP. These keywords are directly related to factors that should be part of a comprehensive evaluation of alternatives. Following is the table Dr. Merrill produced showing keyword occurrences.

Table 3  
Word occurrences in PJM's 2008 RTEP report (322 pages)

<b>Words</b>	<b>Occurrences</b>
reliable, reliability	495
economic, economical	89
environment, environmental	11
greenhouse	0
CO <sub>2</sub>	7
carbon	1
subtotal, five environmental terms	19

Dr. Merrill's table shows that the PJM RTEP planning process is focused on reliability and economics with only fleeting references to the environment. While reliability and economics are both critical, other important factors are given minimal consideration. Still others, like public health, do not appear anywhere in the 2008 RTEP. While security appears in the definitions section of the 2008 RTEP, the national security implications of proposed transmission lines and alternatives are absent in the body of the document.

It was shown in the preceding section of this document - *Is PATH Needed To Keep The Lights On?* - how the limited scope of the RTEP process resulted in recommending PATH as the preferred solution to reliability issues without thoroughly considering other alternatives. It was also shown that a number of alternatives are available, some which are much less costly when compared to PATH. The next two sections demonstrate that PATH will exacerbate air pollution and the impact of electromagnetic fields. Of course, neither of these factors were fully addressed in the RTEP.

## **PATH INCREASES AIR POLLUTION**

This section summarizes testimony provided by Christopher James regarding the effect of PATH on air pollution emissions.

## **PATH Would Increase Power Production from Coal-Fired Plants**

Christopher James testified that the generating plants producing the cheapest power will be drawn upon first as electric needs increase. This approach is known as *economic dispatch*. (James p. 15) Coal-fired plants produce the cheapest power. Most of the coal-fired plants are located in an area known as western PJM.<sup>21</sup> Transmission congestion presently restricts electricity flows from western PJM to the very lucrative markets in Eastern PJM and the New York area. The proponents of PATH claim that the project would relieve a portion of this congestion. Because of this James concluded that:

*“The PATH transmission line will increase generation by dirtier coal-fired power plants in western PJM.”* (James p. 7)

James also conclude:

“PATH’s approval now, before commitments need to be made for generators and other resources, would be a strong incentive to increase the output of existing coal-fired plants, and for developers to build western generation. It would be a disincentive for developers to site future generation and other resources in the East, where they’re most needed.” (Loehr p. 8-9)

“Western generators, both existing and future, will be able to compete with eastern resources without paying for the transmission that makes it possible.” (Loehr p. 32)

“...if a [PATH] line is approved, developers are likely to build in the West, where it would be less expensive, since they will be provided transmission access to the eastern load centers at no cost to themselves.” (Loehr p. 33)

“In summary, PATH would provide a strong disincentive to anyone considering locating generation or other resources in eastern PJM, and a correspondingly strong incentive to build coal-fired generation in western PJM. The seeming obsession with transmission solutions will not only provide an effective subsidy to existing generators in the West, but it will act as a magnet for siting future generators there, as opposed to locating in the East, where they are really needed.” (Loehr p. 33)

## **PATH Would Displace Cleaner Energy Sources**

“The construction of the PATH transmission line will enable generators located in western PJM to access electricity markets in eastern PJM. Differentially higher prices in eastern PJM create economic incentives for generators in western PJM to participate in eastern PJM markets.

---

<sup>21</sup> PJM is the organization which operates transmission lines in an area covering 13 states and Washington, D.C: <http://www.pjm.com/about-pjm/how-we-operate/territory-served.aspx> Western PJM, in the context of the James testimony (p. 9), was considered areas west of 77.5° west longitude or a line roughly drawn just west of State College, PA, Hagerstown, MD, and Richmond, VA. The coal-fired power plants most affected by PATH are located in Ohio and West Virginia (James p. 9).

Generators that have the capacity and flexibility to increase their electricity output will do so. There are many such units in western PJM. These western PJM generators emit more air pollution and greenhouse gases per MWh output than units in eastern PJM. As a result, NO<sub>x</sub> and SO<sub>2</sub> emissions will increase by tens of thousands of tons each year, and CO<sub>2</sub> emissions will increase by several million tons each year.” ([James](#) p. 23)

### **PATH Will Increase Air Pollution**

“In eastern PJM, many natural gas-fired power plants have been constructed in recent years. While these power plants emit less air pollution and greenhouse gases, these plants at times have higher operating costs. This means that at times, these natural gas-fired power plants are the marginal unit, or last unit, that are dispatched to operate for any given hour. The electricity price differentials between eastern and western PJM mean that, if the ability to transfer more MW [of electricity] from western PJM to eastern PJM occurs, such as through the construction of the PATH transmission line, the natural gas-fired power plants in eastern PJM will be among the first power plants to be displaced, i.e. to have their generating output curtailed and reduced. ([James](#) p. 14-15)

“Increased generation in western PJM due to the PATH transmission line will impact Virginia and other eastern states due to transported air pollution.” ([James](#) p. 7) “The pollution will result from increasing power generation from the dirtier coal-fired plants in Western PJM and decreasing production from the cleaner gas-fired plants which account for half the generation in Eastern PJM.” ([James](#) p. 10)

“Construction and completion of the PATH transmission line will increase emissions of sulfur oxides (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), fine particulate (PM<sub>2.5</sub>), mercury and carbon dioxide (CO<sub>2</sub>).” ([James](#) p. 8)

“In total, I [[James](#)] found that, if the [PATH] line carries 2000 MW<sup>22</sup> per hour on every hour from west to east, CO<sub>2</sub> emissions will increase (net) by 3.75 to 7.79 million tons per year, SO<sub>2</sub> emissions will increase by 67,000 to 88,000 short tons per year, and NO<sub>x</sub> emissions will rise by 12,000 to 20,000 short tons per year. These increased emissions result from simply moving generation from the east to the west, with no net gain in power output.” ([James](#) p. 9)

Put another way, PATH will increase “CO<sub>2</sub> emissions by over 2.5%, SO<sub>2</sub> by nearly 5.5%, and NO<sub>x</sub> by over 4.5% from the PJM region.” ([James](#) p. 14)

***Note To The Reader:** If these percentages seems small then consider three facts. First, in a time of increasing concern over climate change and the health consequences of air pollution, any rise should be viewed with alarm since it takes us in the wrong direction.*

---

<sup>22</sup> MW = megawatt of electricity. One MW is equivalent to the electricity used by [1,000 homes](#). So the 2,000 MW PATH could transmit would provide sufficient electricity for two million homes.

*Second, these are increases occurring throughout the massive PJM area which covers 168,500 square miles, 13 of 50 states, has a population of 51 million (17% of the USA total), and accounts for 19% of U.S. GDP. Third, PATH is one of four major transmission line projects proposed within PJM.*

“Construction and operation of the PATH transmission line will cause or contribute to increases in criteria and greenhouse gas pollutants. These pollutants will be transported to the Washington, DC, and Baltimore metropolitan areas. Both metropolitan areas, which include counties in Virginia, Maryland and West Virginia, are designated non-attainment for ozone. Also, several counties in Virginia, Maryland and West Virginia are designated non-attainment for fine particulates (PM<sub>2.5</sub>). Increased emissions from PATH would exacerbate effects upon public health and the environment, and impede the ability of the Commonwealth to attain national ambient air quality standards.” ([James](#) p. 17)

“Another factor that will exacerbate the air pollution effects caused by the PATH transmission line is that the differential in electricity prices during peak periods is highest during the summer months, a period also coincident with higher ozone concentrations. Increased generation in western PJM will produce additional air pollution during the same periods when atmospheric conditions are favorable to the transport of this pollution to the east, increasing the concentrations of ozone and fine particulate pollution in Virginia and neighboring states.” ([James](#) p. 16)

“Second, states are required to reduce air pollution within their state if the pollution in their state affects another state. The first principle means that states have to make every effort possible to reduce pollution in their state even if they are documenting that pollution from another state is what is causing violations of air quality standards.” ([James](#) p. 18) “My [James] rationale for mentioning these provisions of the Clean Air Act is that construction of the PATH transmission line will increase emissions in states that are part of western PJM and these increased emissions will impair the ability of states in eastern PJM to comply with EPA’s public health-based air quality standards for ozone and fine particulate.” ([James](#) p. 19)

“Maryland has continued to document the transport of air pollution from the Ohio River Valley. The Maryland Department of the Environment (MDE) and the University of Maryland have collaborated on a long-term project that involves real-time sampling of the air mass using aircraft. This effort has lead MDE to conclude that long-range transport is responsible for 40-80% of the air pollution that is measured in the Washington, D.C. and Baltimore metropolitan areas.” ([James](#) p. 20)

“If PJM operated under *environmental dispatch* rules, such rules would favor the cleaner generating units in eastern PJM, and these units would increase their output, and transmit power to western PJM. However, regional transmission organizations such as PJM operate on a principle of economic dispatch. The external environmental and public health impacts associated with power plant emissions have not been included in the operating costs of these units. As a

result, the higher emitting coal boilers in western PJM have lower operating costs than the cleaner gas units in eastern PJM. Under economic dispatch rules, generators with the lowest operating costs are dispatched first, and as demand increases, higher cost generators are eventually dispatched.” ([James](#) p. 15)

In summary, “The construction of the PATH transmission line will enable generators located in western PJM to access electricity markets in eastern PJM. Differentially higher prices in eastern PJM create economic incentives for generators in western PJM to participate in eastern PJM markets. Generators that have the capacity and flexibility to increase their electricity output will do so. There are many such units in western PJM. These western PJM generators emit more air pollution and greenhouse gases per MWh output than units in eastern PJM. As a result, NO<sub>x</sub> and SO<sub>2</sub> emissions will increase by tens of thousands of tons each year, and CO<sub>2</sub> emissions will increase by several million tons each year.” ([James](#) p. 23)

### **PATH Threatens Public Health**

“In this ‘core’ case, net GHG<sup>23</sup> and criteria emissions<sup>24</sup> all rise significantly. My [James] conservative estimate, assuming the line will carry 2000 MW per hour every hour, is that CO<sub>2</sub> emissions would rise by 3.75 to 7.79 million tons per year, SO<sub>2</sub> emissions would rise by 67,000 to 88,000 tons per year, and NO<sub>x</sub> emissions would rise by 12,000 to 20,000 tons (see Table 1).” ([James](#) p. 12)

“The additional air pollution will affect Virginia’s existing and future expected ozone and fine particulate non-attainment areas, making it more difficult for the State to meet public health standards.” ([James](#) p. 7)

“Adverse health effects from fine particles include decreased lung function, aggravated asthma, heart attacks, and even premature death. Exposure to ground-level ozone can causes similar health effects.” ([James](#) p. 17)

### **PATH Will Increase Emissions of Climate-Changing Greenhouse Gases (GHG)**

“In this ‘core’ case, net GHG<sup>25</sup> and criteria emissions<sup>26</sup> all rise significantly. My conservative estimate, assuming the line will carry 2000 MW per hour every hour, is that CO<sub>2</sub> emissions

---

<sup>23</sup> GHG = GreenHouse Gases. Primary GHGs include [carbon dioxide, methane, and nitrous oxide](#).

<sup>24</sup> Criteria emissions pertains to pollutants for which air quality standards have been set by [EPA](#) and are generally those poses to the greatest threat to human health and the environment.

<sup>25</sup> GHG = GreenHouse Gases. Primary GHGs are [carbon dioxide, methane, and nitrous oxide](#).

<sup>26</sup> Criteria emissions pertains to pollutants for which air quality standards have been set by [EPA](#) and are generally those poses to the greatest threat to human health and the environment.

would rise by 3.75 to 7.79 million tons per year, SO<sub>2</sub> emissions would rise by 67,000 to 88,000 tons per year, and NO<sub>x</sub> emissions would rise by 12,000 to 20,000 tons (see Table 1).” ([James](#) p. 12)

PATH will increase “CO<sub>2</sub> emissions by over 2.5%, SO<sub>2</sub> by nearly 5.5%, and NO<sub>x</sub> by over 4.5% from the PJM region.” ([James](#) p. 14)

### **PATH Will Increase Acid Deposition (*aka Acid Rain*)**

“Construction and completion of the PATH transmission line will increase emissions of sulfur oxides (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), fine particulate (PM<sub>2.5</sub>), mercury and carbon dioxide (CO<sub>2</sub>).” ([James](#) p. 8)

“Both oxides of nitrogen and sulfur oxides are responsible for acid deposition, which has affected the region’s forests and Chesapeake Bay.” ([James](#) p. 8)

### **PATH Will Increase Water Pollution**

“Mercury emissions from power plants have led many states to impose advisories to limit the consumption of fish caught on their rivers, lakes and other bodies of water. In Virginia, there are existing fish advisories that warn against consumption of fish in eight river basins.” ([James](#) p. 8)

“Construction and completion of the PATH transmission line will increase emissions of sulfur oxides (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), fine particulate (PM<sub>2.5</sub>), mercury and carbon dioxide (CO<sub>2</sub>).” ([James](#) p. 8)

“Both oxides of nitrogen and sulfur oxides are responsible for acid deposition, which has affected the region’s forests and Chesapeake Bay.” ([James](#) p. 8)

### **PATH Will Increase Haze, Further Harming Scenic Views**

“Oxides of nitrogen are pre-cursors to the formation of ozone and fine particulate.” ([James](#) p. 8)

“The fine particulate forms of oxides of nitrogen and sulfur oxides (nitrates and sulfates, respectively) also are responsible for regional haze and impairment of visibility. Shenandoah National Park is particularly affected by regional haze and has many periods of impaired visibility.” ([James](#) p. 8)

### **PATH ELECTROMAGNETIC FIELD THREATENS PUBLIC HEALTH**

Columbia University Professor Martin Blank began his testimony regarding the health effects of electromagnetic fields (EMF) by explaining that:

“The aim of my testimony is to discuss the medical and biological effects of exposure to

EMF, and to show the scientific basis of our understanding of the health risks arising from exposure to the EMF associated with high voltage overhead transmission lines. Research on the biological processes affected by EMF and their consequences to human health has increased our understanding of biological mechanisms and underscored the need for greater protection of populations exposed to EMF, especially young children . Recent research has even provided a plausible biological explanation for the link between EMF and leukemia at the 3-4 milligauss (mG) level found in epidemiology studies.

I [Blank] shall discuss published reports, primarily peer-reviewed epidemiological and laboratory studies, including my own research to show that:

- EMF affects many fundamental biochemical reactions in cells at field strengths in the range of observed epidemiology thresholds;
- Low levels of EMF stimulate stress protein synthesis ('the stress response'), a protective cellular mechanism that is activated by such established harmful stimuli as high temperature and acidity. Activation of the stress response by low levels of EMF indicates that cells react to EMF as potentially harmful;
- Since the code for synthesizing proteins is in the DNA structure, initiation of stress protein synthesis indicates that EMF interact with DNA. At relatively low intensities, EMF leads to DNA chain separation and protein synthesis. At higher intensities, EMF has been shown to damage DNA by causing strand breaks;
- It is generally agreed that cancer is associated with DNA damage (mutations). The link between EMF and DNA damage is seen in a study where children missing DNA repair genes have a much greater incidence of leukemia on exposure to EMF. This suggests that an inability to repair DNA damage caused by EMF can predispose a child to leukemia;
- EMF have also been associated with harmful biological effects in adults. EMF inhibit the secretion of melatonin which normally inhibits oxidation damage. Human breast cancer cells have been shown to grow faster in EMF, probably because of enhanced oxidation damage. EMF is also associated with an increase in the incidence of Alzheimers disease and senile dementia, both of which increase linearly with the duration of EMF exposure. The large database of the study and the demonstrated dose-response of the data strengthen the reliability of the results, which described effects at relatively low EMF;
- There are plausible molecular mechanisms to account for the observed biological effects of low-level EMF. Biochemical studies have shown that EMF can accelerate electron transfer reactions, that electrons can be displaced in DNA, and that the resulting charging can cause DNA disaggregation . The physical properties (electron affinity, fluorescence depolarization) of particular bases (CTCT groups) in segments of DNA activated by EMF appear to contribute to these interactions; and

- In the past, EMF safety issues only considered the need to protect against acute large effects, such as electric shock, while chronic low level exposures were believed to be without consequence to health. Recent research has shown potentially harmful effects associated with chronic low level EMF (i.e. essentially AC magnetic fields<sup>27</sup>) and a need for greater protection. Weak EMF passes easily into cells and constitute a significant risk, especially to children who spend many hours a day in schools and asleep at night in homes located near power lines. The magnetic fields cited in the report by J Michael Silva<sup>28</sup> exceed biologically active levels at the edge of the right of way (ROW), as well as for some distance beyond the ROW, and they constitute a source of prolonged if not continuous exposure above biological thresholds. Since EMF increases with an increase in the electric power carried by the transmission line, addition of a 765 kV line would greatly increase the EMF exposure and the risk to health of people in the vicinity.” ([Blank](#) p. 4-6)

### **Current EMF Safety Limits Are Not Adequate To Protect Human Health**

“Electric fields can make hair stand on end, but they do not effectively penetrate the skin or the membranes of cells, unless they are very high. (They are attenuated by a factor of over a million.) On the other hand, magnetic fields (EMF) pass easily into cells unattenuated and are therefore biologically far more active. Even weak EMF constitute a significant risk to living cells, especially to the rapidly growing cells in children. Low EMF thresholds in several biological systems have been published in peer-reviewed journals, and the first five values in the following Table (*see next page*) are from our laboratory at Columbia University. The measured thresholds for changes in enzyme activity and in biosynthesis of stress proteins are in the range of the epidemiology threshold.” ([Blank](#) p. 6)

“From the table (*see next page*) of EMF Thresholds, it is clear that the safety level set by ICNIRP<sup>29</sup> is approximately 3 orders of magnitude greater than the thresholds of the fundamental biological processes activated by EMF. ICNIRP interpret EMF safety as prevention of acute large effects, such as electric shock, or large induced currents that can fire nerves. They believe that low level exposures, that they call non-thermal, do not cause biological effects and are without consequence to health . ***They may no longer be able to ignore the data showing that many fundamental biological processes are activated by low level EMF.*** The Parliament of the European Union voted in September 2008 to re-examine and readjust safety levels on the basis of

---

<sup>27</sup> Most transmission lines are designed to carry Alternating Current (AC) as opposed to Direct Current (DC).

<sup>28</sup> Mr. Silva testified about EMF and noise on behalf of the applicants seeking approval of PATH. His testimony can be viewed online at: <http://ceds.org/PATHWV/VASCC/silva-testimony.pdf>

<sup>29</sup> The ICNIRP is the International Commission on Non-Ionizing Radiation Protection: <http://www.icnirp.de/>

measured biological effects. Activation of the stress response is certainly indicative of protective cellular responses to low level EMF. [emphasis added]” (Blank p. 7-8)

Biological EMF Thresholds (60Hz range)			
Category	Specific Effect	EMF Level	Reference
Reactions:	Na,K-ATPase	2-3 mG	Blank, Soo, Bioelectrochem 40:63-65,1996
	Cytochrome C Oxidase	5-6 mG	Blank, Soo, Bioelectrochern 45:253-259, 1998
	Malonic acid oxidation	1-2 mG	Blank, Soo, Bioelectrochern 61:93-97, 2003
Stress response:	human cells (breast, HL-60)	<8 mG	Lin et al, J Cell Blochem 70:297-303, 1998
	human DNA + gene	<8 mG	Lin et al, J Cell Biochem 81:143-148, 2001
Cancer cells:	Block inhibition by melatonin (Breast cancer cells)	2-12 mG	Liburdy et al, J Pineal Res 14:89-97,1993
Epidemiology	leukemia/EMF	3-4 mG	
ICNIRP	safety level	1000 mG	

**EMF Levels Caused By PATH Are 100 Times Greater Then Safe Levels**

Applicant witness J. Michael Silva predicted that the maximum EMF levels at the edge of the PATH transmission line right-of-way (ROW) would range from 108 mG to 156 mG.<sup>30</sup> As shown in Professor Blank’s testimony above, the EMF from PATH will be three orders of magnitude (up to 100 times) above the levels (1-2 mG) which begin to cause adverse human health effects.

**EMF & Increased Likelihood of Cancer May Be Due to DNA Damage**

“Cancer is generally believed to result from DNA damage (mutations), and it is the ability of EMF to cause DNA damage by various mechanisms that suggests it as a possible cause. Cancer is actually many diseases and they generally take many years to develop. Childhood leukemia is atypical in appearing after only a few years, but children grow rapidly with active metabolisms that accentuate the molecular damage during protein and DNA synthesis as cells grow and

---

<sup>30</sup> See page 14 in the testimony from Mr. Silva at: <http://ceds.org/PATHWV/VASCC/silva-testimony.pdf>

divide. Natural repair mechanisms correct the errors that occur during normal growth, but they never correct 100% and in protein synthesis, at least one molecule is damaged for every billion made. The errors build up and eventually damage a cell to the point where it cannot function properly.

For a long time it was thought that weak EMF do not have sufficient energy to activate, let alone damage, such large molecules as DNA. However, the stress response has shown activation at very low levels and DNA single strand breaks in the ELF range have shown the damage is possible. We now know that the charging of macromolecular complexes can lead to their disaggregation (Klug, Nobel lectures, 1982; Blank and Soo, *Bioelectrochem Bioenerg* 17:349-360 .1987), and play a key role in membrane transport proteins, including ion channels. It is therefore possible for weak EMF to cause electron movements in DNA that redistribute charges and trigger large molecular rearrangements, e.g. DNA splitting. A possible sequence of steps may start with EMF displacing electrons and charging DNA segments, followed by disaggregation of DNA strands as a result of the charging.

It is interesting that the molecular properties of the CTCT bases on the EMF responsive DNA appear to be well suited for such a mechanism. The CTCT bases have low electron affinities, so electrons would be easily displaced by the EMF. Also, the CTCT (pyrimidine bases) and the GAGA (purine bases) on the complementary DNA strand result in a smaller area when they split, so disaggregation requires less energy and is more likely. Finally, a recent study of the lifetimes of excitation induced by ultraviolet (UV) light in different DNA structures [Schwalb and Temps, *Science* 322 :243-245, 2008] has shown that CTCT bases dissipate energy 10 times faster than GAGA bases and therefore have a greater likelihood of reaching a breaking point, while the rest of the chain is being held in place by the conjugate DNA strand. The CTCT bases are therefore likely to account for the ability of weak EMF in the extremely low frequency (ELF) range to stimulate protein synthesis. We know that at higher field strengths and higher frequencies, EMF can cause dose dependent, single and double strand breaks in DNA (Lai and Singh, *Bioelectromagnetics* 18:156-165, 1997; and others in the online REFLEX Report, 2005). The relevance of DNA damage induced by EMF is reinforced in a recent epidemiology study where children missing the DNA repair genes were found to have a 4 fold greater incidence of leukemia from exposure to EMF as low as 1.4-1.8 mG (Yang et al, *Leukemia and Lymphoma* 49:2344-2350, 2008).” (Blank p. 9-11)

### **EMF Exposure Also Linked To Other Diseases**

“EMF exposures have been shown to modify the tumor suppressing action of melatonin, an important natural secretion of the pineal gland in the brain that affects many natural processes, including sleep (Liburdy et al. *J Pineal Res* 14:89-97, 1993). Studies replicated in several labs show that low level EMF blocks the growth-inhibiting action of melatonin on human estrogen receptor-positive, breast cancer cells, as well as the near-complete blockage of the anticancer (chemotherapeutic) drug Tamoxifen. The threshold is between 2mG and 12mG.

A recent study from Switzerland (Hus et al, Amer J Epidemiology, 169:167-175, 2009) found that exposure to EMF from 220-380kV power lines [PATH will be 765 kV] is correlated with an increase in the incidence of Alzheimer's disease and senile dementia. The risk for those living within 50 meters [164 feet] compared to over 600 meters, increased with duration of exposure over 5, 10 and 15 years, with a doubling of the risk at 15 years. The fields were not measured in the study, but it is possible to estimate that the fields at 50 meters were in the range of 8-10 mG, based on data published by the Bonneville Power Administration . The large population base in this study and the dose response in the data make the association with EMF quite strong.

There are currently many studies of tumors in the head (gliomas, acoustic neuroma, parotid gland tumors) correlated with the use of cellphones. These are generally discussed in terms of the radio frequency EMF that carries the cellphone signals, although there are low frequency components (12Hz, 217Hz) associated with the transmission that could be involved in interactions with DNA.

A recent study of the incidence of cancer in school teachers related the abnormally high incidence (odds ratio, OR = 9.8 vs. expected OR = 2 .78) to the radiofrequency noise on the 60Hz AC lines in the schoolrooms used by the teachers over a period of years. (Milham, Morgan Am . J . Ind. Med . 51 :579-586, 2008). The unusually high cancer incidence was strongly associated with high frequency voltage transients, and it was suggested that this EMF may be a carcinogen similar to ionizing radiation . The data indicated that a single year of employment at this school increased a teacher's cancer risk by 21 %.” (Blank p. 11-12)

### **Adding PATH To Existing Transmission Line Corridors Increases EMF Health Risk**

“The biochemical reactions listed in the Table of Biological EMF Thresholds (discussed earlier), and many other reactions that are interconnected, would be stimulated within the ROW of existing and any added powerlines . This would cause changes in cellular energy production and utilization, as well as activation of DNA and the molecular damage associated with biosynthesis. There would also be increased risk of childhood leukemia, since the 3-4 mG level set in the NIEHS report<sup>31</sup> to Congress would be exceeded along the proposed powerline route where children would be exposed to an increased health risk. It is also clear that the added 765 kV line would raise the EMF well above the present level and extend its influence over a wider area, especially when the proposed 765 kV line would be constructed along side an existing 500 kV line and a 138 kV line. This is clearly not in line with the National Institute of Environmental Health Sciences recommendation *‘That the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards.’* (Blank p. 13-14)

“The health effects of EMF depend on the magnitude (and the direction) of the field, so the addition of a new line adds to the total EMF and the health risk of people exposed to the fields.

---

<sup>31</sup> The NIEHS report is available at: <http://www.niehs.nih.gov/health/docs/niehs-report.pdf>

The EMF along a power line can be minimized by dividing the current into three separate cables that transmit the current alongside each other 120° out of phase. I believe an additional line would still result in a higher EMF. In any case, the estimated EMF are high, and among the highest I have seen proposed near residential areas. I believe that adding any HVAC lines to the existing 500 kV and 138 kV corridor would greatly increase the health risks of the exposed population." ([Blank](#) p. 14-15)

### **Summary of PATH EMF Human Health Effects**

“There can be no doubt that the proposed addition of the 765kV line to the existing 500kV and 138kV lines would add to the level of EMF and thereby create an additional potential risk. This would be contrary to the recommendations of the May 1999 NIEHS Report to the Congress. The studies cited by J Michael Silva indicate a very high EMF at the edge of the ROW. Studies cited in my testimony indicate that even the weaker EMF beyond the ROW have the ability to cause significant changes in living cells by affecting fundamental biological processes, and predisposing them to the development of cancer and other diseases on prolonged exposures. It is therefore essential to minimize exposure of the population to EMF. While the errors in DNA that occur during cell division are most likely in rapidly growing children, recent research has shown that adults are also subject to the same risks on a somewhat longer timescale .

Because of the wide range of biological systems affected, the low response thresholds, the possibility of cumulative effects by repetitive stimulation and the inadequacy of exposure standards, it is urgent that the proposed powerline not be constructed as planned or that it be moved to a distance where the anticipated magnetic fields will not pose a hazard to the community. At the very least, peak EMF levels should not exceed 3-4 mG . The recent study linking of the absence of DNA repair genes to EMF induced leukemia suggests that half that value, 1.4-1.8 mG, would be a more prudent peak limit to aim for." ([Blank](#) p. 15)

Finally, Professor Blank was asked about the EMF related concerns expressed in testimony from Mr. Alfred Ghiorzi who lives near the proposed PATH right-of-way. The Professor responded:

“Mr. Alfred T. Ghiorzi has presented an accurate, albeit, short summary of reports and studies dealing with the harmful effects of EMFs, including some of my own reports. While there are many more studies on EMFs and their harmful effects, he has reported the growing concern among many scientists who are engaged in research on EMF due to growing evidence of significant biological effects with health implications that occur at low levels of exposure." ([Blank](#) p. 16)

Mr. Ghiorzi’s testimony is available at: <http://ceds.org/PATHWV/VASCC/ghiorzi-testimony.pdf>

Perhaps it would be helpful to explain why it was necessary for citizens to go to the expense of hiring these five professionals since all three states will be required to review both transmission line projects in detail.

## **STATE TRANSMISSION LINE REVIEW CRITICAL, BUT MUST BE SUPPORTED BY GOOD PLANNING**

---

The review summarized in this document constitutes the first independent analysis by objective, highly-qualified experts of the PATH project. No similar review has been conducted in the other two states which are directly affected by PATH: Maryland and West Virginia. Nor has the 230-mile, 500-kilovolt Mid-Atlantic Power Pathway (MAPP) transmission line project undergone this level of independent review. Therefore, this review provides an extremely important opportunity to assess whether PATH is likely to be the best option for maintaining affordable, reliable, and environment-friendly electric service. It also provides important insights into the transmission line review process, which is essentially the same in all three states.

This document shows many deficiencies in the thousands of pages of documents submitted to the Virginia SCC in support of PATH. In essence, these deficiencies fail to show that PATH is the best alternative for keeping the lights on in Virginia or the Middle Atlantic States it is intended to serve. Instead other alternatives are likely available which would be just as effective, perhaps more so, at a far lower cost in terms of construction dollars, human health, the environment, national security, and other important values.

This summary ends with a compilation of recommendations offered by the experts on how to improve the Virginia SCC transmission line review process. Essentially they recommend that the State PSCs-SCC, conduct a much more thorough review of transmission line proposals. However, there exists a number of severe impediments to conducting such a review with the current process administered by the Maryland and West Virginia PSCs and the Virginia SCC. These impediment boil down to six limitations:

- minimal experience with major transmission line projects;
- insufficient time for a thorough review;
- lacks of funds for independent verification of applicant assertions;
- heavily reliance upon the applicants for information;
- transmission is the only option considered to resolve reliability issues; and
- the adversarial nature of the review process.

### **Minimal Experience with Major Transmission Line Projects**

In Maryland, it has been at least 30 years since a new major transmission line was proposed. Since 1976, the Maryland PSC has not reviewed a transmission line larger then 500 kilovolts (PATH would be 765 kV) or longer then 30 miles (PATH = 275 miles; MAPP = 230 miles). Both Virginia and West Virginia officials did review the 215-mile, 500 kV Trans-Allegheny Interstate Line (TrAIL) from 2007 to 2009. However, this still constitutes rather limited

experience with the review of multistate extra-high voltage transmission line projects. Maryland officials are being asked to review two of these multistate extra-high voltage transmission line projects simultaneously: PATH and MAPP. Given the lack of experience and an effective mechanism for coordinating review with adjacent states, this makes for substantial difficulty in evaluating the merits of major transmission line projects.

### **Insufficient Time To Thoroughly Review Transmission Lines**

Federal Energy Regulatory Commission (FERC) regulations require that a State make a decision regarding a transmission line project within one year after receiving an application. Should a state fail to meet the one-year time limit then the applicant has the option of petitioning FERC to use the backstop authority provided by the Energy Policy Act of 2005 to grant approval in lieu of state action. The West Virginia PSC is mandated by State law to complete the review within 400 days. One-year or even 400 days is an extremely small amount of time to review a project as complex as an interstate transmission line. For example, the review of Federal Highway Administration (FHWA) projects through the National Environmental Policy Act process requires an average of 3.6 years<sup>32</sup>. In many respects, a major interstate transmission line is just as complex as an FHWA project.

### **Lack of Funds for Independent Study; Heavy Reliance upon Applicant Information**

If a state PSC-SCC had ample resources to conduct independent review of an application then one-year to 400-days might be sufficient time. Unfortunately this is not the case in Maryland, Virginia, or West Virginia. Instead, the PSCs-SCC are heavily dependent upon the transmission line applicants to provide the information required to determine if the project is genuinely needed. Given the adversarial nature of the review process the proponents have a strong disincentive to be fully forthcoming with information. In fact, this very issue prompted the Maryland PSC to suspend review of the Mid-Atlantic Power Pathway (MAPP) transmission line project. In April, 2009, PJM reduced the MAPP project from 230 miles to 160 miles. Maryland officials asked the applicants to explain how this reduction affected the likelihood of the project achieving the enhanced reliability originally claimed. The applicants failed to provide this information which prompted the PSC to suspend the review of MAPP in July 2009. The suspension has yet to be lifted.<sup>33</sup>

### **Transmission Is the Only Option Considered to Resolve Reliability Issues**

With PATH and most other major transmission line proposals there is really only one option before a State PSC or SCC. The Commission has a choice of either approving or rejecting the transmission line. Due to the lack of resources and time Commission staff and other officials do not really have the luxury of determining if non-transmission alternatives provide a better solution to the problems the line is supposed to address. This is true not only in Maryland,

---

<sup>32</sup> See: <http://www.environment.fhwa.dot.gov/strmlng/casestudies/index.asp>

<sup>33</sup> The Maryland Public Service Commission order suspending the review of MAPP is available online at: <http://ceds.org/PATHWV/VASCC/MAPPReviewSuspensionOrder.pdf>

Virginia, and West Virginia but in other states as well. In fact the following statement from a transmission line order issued by the Vermont Public Service Board could have easily been written by the Maryland, Virginia, or West Virginia Commission. In the transmission line case before the Vermont Board it was concluded that they had:

*“...no viable option but to approve a transmission solution for a reliability problem that might have been either deferred or more cost-effectively addressed through demand-side measures or local generation, if there had been sufficient advance planning by VELCO<sup>34</sup> and its owners. To avoid repeating this dilemma in a few short years, we have concluded that we should open a separate investigation into ways to ensure that cost-effective non-transmission alternatives are given full, fair, and timely consideration, and to determine methods for implementing (including funding) those non-transmission alternatives that bear lower societal costs than traditional transmission projects.”*

### **WHY COMPREHENSIVE ENERGY PLANNING IS ALSO NEEDED**

Given the limitations of the State review process, we need an overarching planning effort in addition to the PJM Regional Transmission Expansion Plans. Such a planning effort would:

- begin with estimates of future energy needs (including independent verification of projections by PJM and others);
- identify all reasonable alternatives for meeting those needs;
- rank each alternative with regard to the factors affected by our energy choices (reliability, cost, national security, climate change, public health, etc.); and
- end with a listing of preferred alternatives - those which best serve our needs and those of future generations.

The comprehensive energy plan resulting from this process would serve as a primary reference for use by the State PSCs-SCC to determine if a proposed energy facility was the best option for meeting future needs. In other words, the planning effort would reveal whether electric reliability issues are best resolved by upgrading existing transmission lines and substations, building new transmission lines, reducing peak use through demand-side management and improved efficiency, building new generating facilities, etc.

If the planning process:

- allowed participation by numerous and diverse stakeholders;
- made it easy for participants to access information; and

---

<sup>34</sup> VELCO is the Vermont Electric Power Company, Inc: <http://www.velco.com>

- allowed participants ample opportunity to freely discuss the merits of various energy choices,

then the State review process would likely produce better, less contentious decisions. In other words, those living near proposed facilities would likely find it easier to accept the project if it was the product of a collaborative, balanced planning process such as that described above as opposed to a decision which appears driven more by profit than public good.

### **THE EXPERTS' RECOMMENDATIONS FOR IMPROVING STATE REVIEWS**

Following are specific recommendations presented in the testimony from the experts.

1. “If PJM operated under *environmental dispatch* rules, such rules would favor the cleaner generating units in eastern PJM, and these units would increase their output, and transmit power to western PJM. However, regional transmission organizations such as PJM operate on a principle of *economic dispatch*. The external environmental and public health impacts associated with power plant emissions have not been included in the operating costs of these units. As a result, the higher emitting coal boilers in western PJM have lower operating costs than the cleaner gas units in eastern PJM. Under economic dispatch rules, generators with the lowest operating costs are dispatched first, and as demand increases, higher cost generators are eventually dispatched.” ([James](#) p. 15)
2. “My [Fagan] primary recommendation is that the Virginia State Corporation Commission deny the application outright due to the unsupported assertions of need for the proposed PATH line. Alternatively, at a minimum the applicants must re-analyze the alleged need for PATH using current, reasonable input assumptions for demand-side resources and forecast peak load. Such assumptions should clearly include the results of the May 2009 RPM auction and the demand-side resources made available by that auction, and should also recognize the contribution to peak load reduction that will arise from the state-level initiatives identified and described in this testimony. The assumptions should also include a current peak load forecast. As part of any required re-examination of alleged PATH need, the applicants should analyze alternative reliability solutions and should conduct a full economic assessment of the effect on PJM ratepayers of the different alternatives.” ([Fagan](#) p. 8-9)
3. “PJM’s one-at-a-time planning is a piecemeal approach to solving reliability problems. PJM, as the RTO, needs to step up to the plate and start planning its system on a coordinated, integrated basis.” ([Loehr](#) p. 9)
4. “The real reliability problem in PJM is the present high dependence of the eastern load centers on remote generation and multiple EHV transmission lines, each hundreds of miles long. This is the problem PJM should be addressing; instead, PJM is pursuing policies which will make the problem worse.” ([Loehr](#) p. 12)

5. “According to the PATH response to SierraVA-IV-61, there is 67,635MW of generating capacity in the Mid-Atlantic LDA as of October 2009 – right now. Given this amount of existing generating capacity, not even counting whatever additional capacity will be added over the next five years, why isn’t a 6,000 MW CETO enough? PJM should place greater emphasis on incenting new generation to locate within the Mid-Atlantic LDA, which would provide greater reliability to the eastern load centers.” ([Loehr](#) p. 24-25)
6. “First, PJM’s planning needs to consider environmental and economic effects thoroughly and from the beginning, even for projects that they feel are justified by reliability needs.” ([Merrill](#) p. 34)
7. “The regional power system faces two possible paths. One path relies more and more on massive long transmission lines bringing coal-fired power to the eastern seaboard. This is not sustainable and makes the system brittle, susceptible to cascading blackouts. Ten state governors in the region are on record as opposing this path. The other path is development of cleaner local gas-fired plants and local renewables, including demand-side resources. This is sustainable.” ([Merrill](#) p. 35)
8. “PJM’s focus on transmission, with mandatory imposition on member companies, makes it hard for companies to develop non-transmission alternatives. This Commission [VA SCC] should insist on a true strategic assessment of alternative long-range paths as a part of every application.” ([Merrill](#) p. 36)