PENNSYLVANIA PUBLIC UTILITY COMMISSION
Uniform Cover and Calend[illegible] Sheet



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| 1. REPORT DATE: December 15, 1989 | 2. BUREAU AGENDA NO.: FEB-90-E-1* |
| 3. BUREAU: CEEP | |
| 4. SECTION(S): Engineering | 5. PUBLIC MEETING DATE: February 1, 1990 |
| 6. APPROVED BY: Director: Six 7-2548 Supervisor: Yanuck 3-1559 | |
| 7. MONITOR: | |
| 8. PERSON IN CHARGE: Prowell 7-3559 | |
| 9. DOCKET NO.: A-110550F055 | |

10. (a) CAPTION (abbreviate if more than 4 lines)
(b) Short summary of history & facts, documents & briefs
(c) Recommendation

(a) Letter of Notification of Philadelphia Electric Company relative to reconstructing and rebuilding of the existing 138 KV line to operate as a Woodbourne-Heaton 230 KV line in Montgomery and Bucks Counties.

(b) On November 21, 1989, Philadelphia Electric Company filed the above-captioned Letter of Notification. Authority for this procedure is provided for at 52 Pa. Code §57.72(d)(1)(iv) and (v).

(c) The Bureau of CEEP recommends that the Commission approve the Letter of Notification filed by Philadelphia Electric Company.

mr

FOLDER

Concurred in by:

Law Bureau

11. MOTION BY: Commissioner Chm. Shane
SECONDED: Commissioner Smith

Commissioner Rhodes - Yes
Commissioner Fischl - Yes
Commissioner Rolka - Yes

CONTENT OF MOTION: Staff recommendation adopted.

DOCKETED
MAR 05 1990

February 9, 1990

A-110550F055

Donald Blanken, Esquire
Philadelphia Electric Company
2301 Market Street
P.O. Box 8699
Philadelphia, Pa. 19101

Letter of Notification of Philadelphia Electric Company relative to reconstructoring and rebuilding of the existing 138 KV line to operate as a Woodbourne-Heater 230 KV line, in Montgomery and Bucks Counties.

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To Whom It May Concern:

This is to advise you that an Order has been adopted by the Commission in Public Meeting on February 1, 1990 in the above entitled proceeding.

A copy of this Order has been enclosed for your records.

Very truly yours,

Jerry Rich, Secretary

DOCUMENT FOLDER

smk
Encls.
Cert. Mail

DOCKETED
APR 17 1990

PENNSYLVANIA
PUBLIC UTILITY COMMISSION
Harrisburg, PA 17120

Public Meeting held February 1, 1990

Commissioners Present:

Bill Shane, Chairman
William H. Smith, Vice-Chairman
Joseph Rhodes, Jr.
Frank Fischl
David W. Rolka

DUPLICATE RECORD
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

Letter of Notification of Philadelphia Electric Company relative to reconstructoring and rebuilding of the existing 138 KV line to operate as a Woodbourne-Heater 230 KV line, in Montgomery and Bucks Counties.

A-110550F055

DOCUMENT
FOLDER

ORDER

BY THE COMMISSION:

On November 21, 1989, Philadelphia Electric Company (PECO) filed a Letter of Notification in lieu of a siting application to reconductor and reconstruct an existing 138 KV transmission line for 230 KV operation. Authority for this procedure is provided for by separate sections of the Commission's siting regulations; Section 57.72(d)(1)(iv) and Section 57.72(d)(1)(v).

Section 57.72(d)(1)(iv) specifically provides that a Letter of Notification in lieu of application may be filed for an HV line for which the voltage is proposed to be increased above its present levels, so long as the size, character, design or configuration of the proposed HV line does not substantially alter the right-of-way (ROW). Section 57.72(d)(1)(v) specifically provides that a Letter of Notification in lieu of application may be filed for an HV line which is to be reconductored or reconstructed so long as the size, character, design or configuration of the proposed HV line does not substantially alter the ROW.

Copies of this Letter of Notification were served in accordance with Section 57.72(d)(3) of the Commission's siting regulations, and no protests have been received.

PECO states that the area served by its existing Warrington, Buckingham, Woodbourne, Byberry and Heaton 230-34.5 KV substations is one of the fastest growing load areas on its system. In the three-year period from summer 1985 to summer 1988, the load on the 34.5 KV subtransmission system in this area grew by more than 32% (as compared to 13% for the PECO system as a whole). This very high load growth has precipitated both the expansion of existing distribution facilities as well as the construction of new

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distribution substations, including the Linton 230-34.5 KV distribution substation, which is scheduled to be in service for the 1990 summer peak.

However, the high load growth has also precipitated some potential electrical problems. A case in point is the new Linton substation which is to be supplied by the Buckingham-Woodbourne 230 KV line, a radial line eminating from Buckingham substation. Unlike Woodbourne, the Linton substation will have no 34.5 KV network support, but will depend entirely on the transmission system for its supply. In the event of an outage of that portion of the Buckingham-Woodbourne 230 KV line between Buckingham and Linton, the supply for both the Linton and Woodbourne 230-34.5 KV substations will have to come from the 138 KV transmission system via the Byberry substation. However, load flow studies indicate that this outage scenario could cause emergency overloads on the 138 KV system and severe voltage drops throughout the area.

Consequently, pursuant to this Letter of Notification, PECO proposes to construct a 12.8 mile, 230 KV single-circuit transmission line between the Woodbourne and Heaton substations. This proposed transmission line will provide a second source of 230 KV supply for both the Woodbourne and Linton substations, thus preventing line overloads and low voltage conditions in the event of an outage of the Buckingham-Linton 230 KV line segment.

PECO plans to utilize the existing Trenton Cutoff Branch freight line of Consolidated Rail Corporation (Conrail) as the route for the proposed line, since this railroad route passes in close proximity to both the Woodbourne and Heaton substations. The right-of-way of the proposed line will be located almost entirely on railroad property, which consists of a 60-foot wide ROW on which are located a double-track railroad, a wood pole line supporting railroad signal and communication cables, and a now-abandoned two-conductor 138 KV transmission line which was part of a former railroad electrification system.

In addition, PECO has purchased a two-acre vacant, irregularly-shaped property in the vicinity of Woodbourne substation, which separates the substation site from the railroad ROW. This property will contain 0.06 miles of the line (317 feet) and is necessary to enable the proposed line to avoid height limitations associated with Buehl Field, an airport which abuts railroad property in the area.

According to PECO, the proposed line will be constructed using Conrail's existing transmission line structures for support. About 176 of the 236 existing railroad transmission line support structures will be reused by PECO. Approximately ten of the railroad structures must be replaced because of prior derailment damage, while another 50 structures must be replaced because they are inadequate to support the proposed new line's mechanical loads. In addition, PECO estimates that eight new structures will be necessary to connect the proposed new line to the substations. Thus, approximately 244 structures, both existing and new will be used to support the proposed line.

Prior to installation of new insulators and conductors, PECO will remove the existing railroad transmission line conductors, insulators, cross arms, 6.6 KV signal feeder line, catenary support arms, and all unnecessary guy wires from each railroad structure. After all the former railroad

hardware is removed from the railroad structures (wide-flange columns), reinforcement and extensions (5 to 10 feet) will be added where necessary.

A new overhead ground wire will be installed at the top of the wide-flange columns, and three horizontal post insulators will be bolted thereto in order to support the conductors in a delta configuration. Replacement for the inadequate railroad structures and any new structures will be single-circuit tubular steel poles for tangent construction and light angles. For heavy angles and deadends, the proposed line will be supported by single-circuit steel poles with conductors supported from steel crossarms. Conductors for the proposed line will consist of one 1590 KCMIL 59/19 ACSR conductor per phase. The overhead ground wire will consist of one 7#5 alumoweld conductor.

Analysis of the foregoing detail reveals that in this case, PECO proposes to utilize an existing utility corridor on which there is erected an existing (but now abandoned) 138 KV transmission line as a common corridor for the proposed 230 KV transmission line. Consequently, the rebuilding and reconductoring of the existing 138 KV transmission line into a single circuit 230 KV transmission line utilizing most of the existing support structures will not substantially alter the existing ROW. Moreover, the now-abandoned railroad electrification is more than 50 years old, and most of the industrial and residential properties adjacent to the railroad ROW were constructed with the railroad transmission line and catenary system already in place, implying at least some acceptance thereof.

PECO states that the design, construction, maintenance and operation of the proposed line will be in accordance with the National Electrical Safety Code, and that minimum standards set forth therein will be met or exceeded. Line construction is scheduled to begin in the spring of 1990 for an in-service date of Spring 1991. Total cost of the project including ROW acquisition is $20,100,000.

The formal PECO Letter of Notification and the manner in which it was filed substantially conform to the requirements of 52 Pa. Code Chapter 57. Moreover, the Commission has reviewed the filing and does not find it to be inconsistent with applicable law or Commission policy regarding transmission lines; **THEREFORE,**

IT IS ORDERED: That the Letter of Notification filed by Philadelphia Electric Company for approval to reconductor and reconstruct an existing 12.8 mile, 138 KV transmission line for 230 KV operation in Montgomery and Bucks Counties be, and is hereby approved.

BY THE COMMISSION,

Jerry Rich
Secretary

(SEAL)

ORDER ADOPTED: February 1, 1990

ORDER ENTERED: FEB - 9 1990

AUG 31 1990
Public Utility Commission

ORIGINAL

RLS

Eugene Farion
1624 Bonnie Brae Drive
Huntingdon Valley, PA 19006

August 28, 1990

Public Utility Commission
P.O. Box3265
Harrisburg, PA 17120

A-110550F055

DUPLICATE RECORD.
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT.

Re: PECo Power Lines

Dear Sirs:

The Philadelphia Electric Company is in the process of erecting 70 foot towers for 230,000 volt power lines which are to be strung along the railroad tracks running along the rear boundry of my back yard. I have been informed that power lines of such voltage and at such a height emit electromagnetic fields which may cause cancer. Naturally, I am very concerned.

On August 7, 1990, I telephoned the office of Congressman Peter Kostmayer in Langhorne, Pennsylvania in order to voice my concern. I was informed that studies have shown that in fact such power lines may in fact cause cancer in those who live in their proximity. Hence, I protest Philadelphia Electric's construction of said power lines and demand that you order it to cease and desist in this construction, at least until more definitive studies can be made as to the effects of the electromagnetic fields emitted from these power lines on humans in their vicinity.

Respectfully yours,

Eugene Farion

Eugene Farion

DOCKETED
SEP 10 1990

SUGARMAN & ASSOCIATES
ATTORNEYS AT LAW
16TH FLOOR, CITY PLACE
101 NORTH BROAD STREET
PHILADELPHIA, PENNSYLVANIA 19107
215-751-9733
FAX 215-751-9891

SUITE 124
3251 PROSPECT STREET, N.W.
WASHINGTON, D. C. 20007
202-887-5858

ROBERT J. SUGARMAN
ALAN M. KAPLAN
MARCIA E. BERRY

ROBERT RAYMOND ELLIOTT, P.C.*
*COUNSEL*

CONNIE A. BARNDT
*LEGAL ASSISTANT*

*NOT ADMITTED IN PA.

ORIGINAL

September 4, 1990

Mr. Jerry Rich
Secretary Pennsylvania Public
Utility Commission
P.O. Box 3265
Harrisburg, PA 17120

RECEIVED
SEP 14 1990
SECRETARY'S OFFICE
Public Utility Commission

Re: Application of Philadelphia Electric Company
No. A-110550-F055

Dear Mr. Rich:

Please find enclosed the Petition to Intervene, to Reopen, and to Suspend of Petitioners Small et al in the above matter. Please file the Petition and advise me of any additional steps I must take at this time. By copy of this letter, I certify that I have served a copy of the enclosed Petition upon counsel for the Applicant at 2300 Market St., Philadelphia, Pa., this day, and on the trial staff of the Commission.

Sincerely,

ROBERT J. SUGARMAN

RJS:er
Enc.

cc: Donald Blanken, Esq.
Trial Staff

c:\rjs90\98

DOCUMENT
FOLDER

ORIGINAL

BEFORE THE PENNSYLVANIA
PUBLIC UTILITY COMMISSION

RECEIVED
SE 1 1990
SECRETARY'S OFFICE
Public Utility Commission

IN RE: LETTER OF NOTIFICATION:
OF PHILADELPHIA ELECTRIC :
COMPANY, :
: NO. A-110S50 F055
:
DUPLICATE RECORD:
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT:

DOCKETED
SEP 20 1990

EMERGENCY PETITION OF NON-NOTICED PROPERTY OWNERS
TO INTERVENE, FOR REOPENING AND TO SUSPEND APPROVAL

Petitioners Robert Small, and Jill Small, Frank English and Diane P.S. Koerper, and others, named herein, as property owners entitled to notice pursuant to 52 Pa. Code 57.71, et seq. but who were not notified of the proceedings herein, or affected citizens, move to be made parties in these proceedings, to reopen the proceedings, and to suspend the approval and aver as the basis thereof the following:

1. Petitioners are Robert Small, Jill Small, Frank English, Diane P.S. Koerper, and seventy other individuals and an organization which is a Pennsylvania non profit corporation, Parents Against an Unsafe Environment (PAUSE). All individual petitioners' full names and addresses are attached hereto as Exhibit "A". The right to name others is reserved.

2. Petitioners, other than petitioner PAUSE, are all "property owners" whose properties and property rights will be affected by the construction of a 230 KV transmission line by Philadelphia Electric Company, the applicant herein, and which

PAUSE

is the subject of these proceedings.

3. Although applicant characterized the proposed line as a reconstruction, it is in fact a new line on a right of way, never occupied by applicant, and not used for a high frequency line for at least ten years by anyone.

4. Petitioners' property interest in the property to be occupied by the proposed facility include, as to Petitioners Robert Small and Jill Small, fee simple title to a vertical portion of the right-of-way proposed to be used, as to all individual petitioners, ownership of the air space intended to be occupied by the proposed facility for dispersion of electromagnetic waves; and ownership of air space adjacent to the proposed transmission lines, which said petitioners have used for the growth of tall trees in their air space outside the vertical dimensions of the proposed right-of-way.

5. Although applicant Philadelphia Electric Company, being extremely knowledgeable about the ownership, knew or should have known of petitioners' ownership of the air space adjacent to the vertical dimensions of the railroad right-of-way, it nevertheless deliberately or recklessly falsely informed the Commission that no ownership of property would be affected by the project. Commission Regulation 57.72 requires, as to proceedings such as these, that all persons having property ownership affected by the project be notified of the proceedings, and be admitted as parties thereto upon such notice and their request. As a result of applicant's mischaracterization of the project, no notice was

given, either by publication or personally; and petitioners have only recently learned of the line by observing construction preparation.

6. Had applicant properly filed and disclosed the foregoing and had petitioners been given notice as required by the rules, and had the matter proceeded to hearing petitioners would have participated fully in the proceedings as parties, and would have brought significant matters to the attention of the Commission, which matters were precluded from proceedings by the failure of the applicant to give notice to the persons actually affected by the proceeding, as required by the regulations.

7. The issues which petitioners would have presented, and now wish to present, to the Commission include the following:

(a) No justification has been proved for the nature, extent, and location of the proposed facility, including necessity for its existence, and necessity for refusing to over-build existing transmission lines connecting the same destinations, directly or indirectly, and petitioners believe and aver, that less dangerous alternatives are available, if the line is needed at all.

(b) If located as proposed, the transmission line would intrude on petitioners' property through invasion of air and create an acknowledged risk of severe health effects, including cancer and other mutagenic diseases, due to the electromagnetic fields (EMF). Although applicant PECO has acknowledged to the petitioners that such risk exists, and has

further stated that the determination of action to be taken in regard to such risk is a "societal" decision, applicant has nevertheless undertaken to preclude affected parties such as petitioners from that decision. The right of way is heavily developed with homes located close to the right of way, and formal and informal children's play areas.

(c) Although acknowledging that the risks from EMF cannot be excluded, and although it is known that because of this concern, aesthetics, interference with reception, and heightened potential for destructive fires, properties located in close proximity to such transmission lines have been substantially and adversely precluded from the normal sales market, and therefore that the proposed line would substantially depreciate petitioners' values, making it impossible for them to replace their homes, and thereby save themselves and their children from these effects, nevertheless, the applicant proceeded to initiate and seek final permission for the project, without affording an opportunity for petitioners, although affected property owners, to participate in the proceedings affecting their property rights and their health and that of their children.

8. Petitioners will also prove that the letter of notification procedure was improperly utilized by misstatement of the critical facts, specifically by misinforming the Commission that this line is a reconstruction of another line, whereas in fact, it is intended to construct PECO's first and only line on land in which PECO had previously had no interest or rights. In

fact, the present use of the right-of-way is that of a railroad right-of-way, and the only transmission line was one utilized by Conrail for its own purposes, which had been long abandoned prior to PECO's application. The Commission was thus misled as to whether there was any need for hearings to consider enhanced health risk, and property loss, by being informed that the line would simply entail a reconstruction.

9. The proposed line violates local zoning, but has not been disclosed as a new and different use to localities. To the contrary the notice given to municipalities concealed the change in use.

10. In addition to violating the rules of the Commission, and depriving petitioners of the opportunity to be heard, the applicant has also, as a practical matter, and as a legal matter effected an inverse condemnation, by taking petitioners' property without due process or any other legal remedy.

11. Upon leaving of the contended construction, petitioners promptly contacted applicant regarding their opposition and their interest in the matter. Applicant has engaged petitioners in dialogue, but has wholly refused to consider any means of satisfaction, specifically including withholding further construction activities, as a result of which applicant is threatening to and has commenced construction related activities. Unless suspended, as practical matter, this will render it difficult for the Commission to achieve proper disposition of this matter after petitioners have had opportunity to be heard

through reopening the proceedings.

WHEREFORE, petitioners request that the Commission by order admit them as parties in the proceeding, order the proceedings reopened, and suspend the action heretofore taken on February 2, 1990 pending further disposition.

ROBERT J. SUGARMAN
Counsel for Petitioners

OF COUNSEL:

SUGARMAN & ASSOCIATES
16th Floor, City Place
101 N. Broad Street
Philadelphia, PA 19107
(215) 751-9733
rjs90/87

## PETITIONERS

| NAME | COMPLETE/ADDRESS |
|---|---|
| Robert M. Audrassy | 597 Valley View Rd.<br>Langhorne, PA 19047 |
| Anna Benedetto | 1400 Clover Lane<br>Feasterville, PA 19053 |
| Alfredo Benedetto | 1400 Clover Lane<br>Feasterville, PA 19053 |
| Marie Burnell | 625 Valley View Rd.<br>Langhorne, PA 19047 |
| George Charokapos | 1108 Renee Circle<br>Feasterville, PA 19053 |
| Zena Charakapos | 1108 Renee Circle<br>Feasterville, PA 19053 |
| Mauro Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Teroloni Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Eligio Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Lois Cohen | 1337 Roberts Ave.<br>Feasterville, PA 19053 |
| Lynn E. Cohen | 1509 Grace Circle<br>Feasterville, PA 19053 |
| Frank Cohen | 1337 Roberts Ave.<br>Feasterville, PA 19053 |
| Willie Cohen | 1509 Grace Circle<br>Feasterville, PA 19053 |
| Karen Dalrynple | 583 Valley View Rd.<br>Langhorne, PA 19047 |
| Elizabeth G. Dever | 540 Valley View Rd.<br>Langhorne, PA 19047 |
| Rosemarie Dilliplucee | 18 Wychwood Lane<br>Langhorne, PA 19047 |
| John Dilliplucee | 18 Wychwood Lane<br>Langhorne, PA 19047 |

EXHIBIT A

| | |
|---|---|
| Margaret Dontco | 1111 Renee Circle<br>Feasterville, PA 19053 |
| Gus Dontas | 1116 Renee Circle<br>Feasterville, PA 19047 |
| Frank Cryle | 239 W. Bristol Rd.<br>Feasterville, PA 19053 |
| Dustey A. Euglut | 239 W. Bristol Road<br>Feasterville, PA 19053 |
| Linda M. Engle | 634 Daos Ct.<br>Langhorne, PA 19047 |
| Arthur J. Etzwelt | 621 Valley View Rd.<br>Langhorne, PA 19047 |
| Alan M. Fallick | 521 Valley View Rd.<br>Langhorne, PA 19047 |
| Judith S. Fallick | 521 Valley View Rd.<br>Langhorne, PA 19047 |
| Linda & George Henry | 508 Militia Hill Rd.<br>Southampton, PA 18966 |
| Edward F. Koerper, Jr. | 300 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Thomas J. Fling, Jr. | 1113 Renee Circle<br>Feasterville, PA 19053 |
| Edward L. Gracher | 505 Valley View Road<br>Langhorne, PA 19047 |
| Allen Thore | 1112 Renee Circle<br>Feasterville, PA 19053 |
| Joseph A. Inerllinger | 1361 Clover Lane<br>Feasterville, PA 19053 |
| William I. Kase | 1350 Clover Lane<br>Feasterville, PA 19053 |
| Virginia B. Kase | 1350 Clover Lane<br>Feasterville, PA 19053 |
| Kenneth E. King | 650 Daos Court<br>Langhorne, PA 19047 |
| Diane P.S. Koerper | 556 Militia Hill Road<br>Southampton, PA 18966 |

| | |
|---|---|
| Jacinta M. Koerper | 300 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Scott Koerper | 556 Militia Hill Rd.<br>Southampton, PA 18966 |
| Mac Kwasinski | 1360 Clover Lane<br>Feasterville, PA 19053 |
| Walter Kwasinski | 1360 Clover Lane<br>Feasterville, PA 19053 |
| Michael C. Lawler | 1513 Grace Circle<br>Feasterville, PA 19053 |
| Margaret E. Lawler | 1513 Grace Circle<br>Feasterville, PA 19053 |
| Claudia Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Annamaria Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Melissa Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Michelle Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Dennis Tripollo, M.D. | 550 Valley View Rd.<br>Langhorne, PA 19047 |
| Maryjane McHugh | 584 Valley View Rd.<br>Langhorne, PA 19047 |
| Ruth Mebs | 548 Militia Hill Rd.<br>Southampton, PA 18966 |
| Maryellen F. Morgan | 1109 Renee Circle<br>Feasterville, PA 19053 |
| Richard L. Morgan | 1109 Renee Circle<br>Feasterville, PA 19053 |
| Judy Meelinger | 1361 Clover Lane<br>Feasterville, PA 19053 |
| Janis E. Peregoy | 1380 Clover Lane<br>Feasterville, PA 19053 |
| Francine G. Peregoy | 1380 Clover Lane<br>Feasterville, PA 19053 |

| | |
|---|---|
| Tony Poulos | 1501 Grace Circle<br>Feasterville, PA 19047 |
| Karen Poulos | 1501 Grace Circle<br>Feasterville, PA 19047 |
| Steven M. Seder | 1105 Renee Circle<br>Feasterville, PA 19053 |
| John & Pat Princevalli | 532 Militia Hill<br>Southampton, PA 18966 |
| Traci Princevalli | 532 Militia Hill<br>Southampton, PA 18966 |
| Meryl Seder | 1105 Renee Circle<br>Feasterville, PA 19053 |
| Harry C. Senopould | 1120 Renee Circle<br>Feasterville, PA 19053 |
| Robert Small | 15 Wychwood Lane<br>Langhorne, PA 19047 |
| Jill Small | 15 Wychwood Lane<br>Langhorne, PA 19047 |
| James J. Stevenson | 290 Casey Circle<br>Huntingdon Valley, PA 19006 |
| George E. Stewart, Jr. | 639 Daos Court<br>Langhorne, PA 19047 |
| Dorothy N. Stevenson | 290 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Cathee F. Swanson | 1101 Renee Circle<br>Feasterville, PA 19053 |
| Noreen F. Swanson | 1101 Renee Circle<br>Feasterville, PA 19053 |
| Claudia J. Wallick | 1140 Renee Circle<br>Feasterville, PA 19047 |
| Mara Wagman | 1117 Renee Circle<br>Feasterville, PA 19053 |
| Alan M. Wagman | 1117 Renee Circle<br>Feasterville, PA 19053 |
| Earl Weiss | 281 Casey Circle<br>Huntingdon Valley, PA 19006 |

| | |
|---|---|
| Elizabeth Weiss | 281 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Ingl A. Wing | 1113 Renee Circle<br>Feasterville, PA 19053 |
| Maria Yannena | 522 Valley View Rd.<br>Langhorne, PA 19047 |

RJS.PET

VERIFICATION

FRANK ENGLISH states that he is a petitioner in the within matter and that the facts set forth in the foregoing Petition of Non-noticed Property Owners to Intervene, for Reopening, and Suspension are true and correct to the best of his knowledge, information and belief and that this statement is made subject to the penalties of 18 Pa. C.S. Sec. 4904 relating to unsworn falsification to authorities.

Dated: September 10, 1990

Frank English

FRANK ENGLISH

rjs90/87

ORIGINAL

# PHILADELPHIA ELECTRIC COMPANY

LEGAL DEPARTMENT

James W. Durham
Senior Vice President
and General Counsel

Eugene J. Bradley
Of Counsel

Bjarnie R. Anderson
Legal Administrator

2301 MARKET STREET, BOX 8699
PHILADELPHIA, PA 19101
(215) 841-5544 FAX: 568-3389

Paul Auerbach
Donald Blanken
Paul R. Bonney
Ellen M. Cavanaugh
Rudolph A. Chillemi
T. H. Maher Cornell
Edward J. Cullen, Jr.
Katherine K. Dodd
Aubra S. Gaston
E. C. Kirk Hall
J. Lindsay Johnston
Kimberly Lewis
T. Michael Mather
Assistant General Counsel

September 18, 1990

RECEIVED
SEP 1990
SECRETARY'S OFFICE
Public Utility Commission

Mr. Jerry Rich, Secretary
Pennsylvania Public Utility Commission
P. O. Box 3265
Harrisburg, PA 17120

Re: Letter of Notification of Philadelphia Electric Company relative to reconductoring and rebuilding of the existing 138 kV line to operate as a Woodbourne-Heaton 230 kV line, in Montgomery and Bucks Counties. - A-110550F055

Dear Mr. Rich:

Enclosed for filing with the Commission is an original and three copies of the Answer of Philadelphia Electric Company to the Emergency Petition to Intervene, to Reopen, and to Suspend Approval, filed on behalf of certain persons, in the above matter.

I have today served a copy of the above Answer on Robert J. Sugarman, Esquire, attorney for petitioners, by First Class mail.

Very truly yours,

Donald Blanken

Donald Blanken

DB:bmt
Enclosures

cc: Robert J. Sugarman, Esquire

DOCUMENT FOLDER

DOCKETED
SEP 21 1990

BEFORE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DUPLICATE RECORD.
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

RECEIVED
SEP 20 1990
SECRETARY'S OFFICE
Public Utility Commission

Letter of Notification of :
Philadelphia Electric Company :
relative to reconductoring and :
rebuilding of the existing 138 kV: A-110550F055
line to operate as a Woodbourne- :
Heaton 230 kV line, in Montgomery:
and Bucks Counties. :

DOCUMENT
FOLDER

ANSWER OF PHILADELPHIA ELECTRIC COMPANY
TO EMERGENCY PETITION OF NON-NOTICED PROPERTY OWNERS
TO INTERVENE, FOR REOPENING AND TO SUSPEND APPROVAL

NOW COMES, Philadelphia Electric Company (hereinafter "PECO") by its attorney, DONALD BLANKEN, Esquire, and answers the Emergency Petition to intervene, reopen and suspend approval, filed on behalf of certain property owners.

1. Denied. To the best of PECO's knowledge, information and belief, "PAUSE" has not been accepted as a non profit corporation in the Commonwealth of Pennsylvania.

2. Denied that petitioner property owners own property rights that will be affected by construction of PECO's 230 kV transmission line. None of the petitioners own property within the transmission line right-of-way.

3. Denied. PECO characterized the proposed line as a proposed rebuilding and reconductoring of an abandoned railroad 138 kV transmission line because it purchased the structures used to support the 138,000 volt line with the conductors in place but de-energized. PECO clearly and accurately stated the facts

regarding the proposed "reconstruction" and installation of its Woodbourne-Heaton 230 kV line. It averred in the Letter of Notification:

> "PECO has entered into an agreement to purchase from Conrail an easement along the rail line, together with the structures supporting the abandoned 138 kV transmission line and electrification system for the purpose of building the proposed 12.8 mile long Woodbourne-Heaton 230 kV line. The proposed rebuilding and reconductoring will be done entirely within the existing railroad right-of-way."

4. Denied that the petitioners, the Smalls, own property within the transmission line right-of-way. Accordingly, no portion of the Small property ownership is within the transmission line right-of-way, nor are the property ownership rights of any other petitioner within the transmission line right-of-way. Furthermore, no ownership rights petitioners have, wherever they may be located, will be interfered with by PECO's transmission line.

5. Denied. Petitioners' transparent attempt to convince the Commission that they should have been served with notice of the Letter of Notification is based on a blatant misstatement of the Commission's regulations concerning such service.

The persons designated to received a copy of the notice of the Letter of Notification are such "persons . . . owning property within the proposed right-of-way . . ." See section 57.72(c)(4), 52 PA. Code. Petitioners do not fall within this category.

6. Denied that PECO did not properly file or disclose its

proposed transmission line construction through its Letter of Notification. Over 25 public officials were notified of the filing, including the county governing bodies of Bucks and Montgomery Counties and the governing bodies of all municipalities through which the line passed, as well as the planning bodies of each municipality. Also several state agencies were served in accordance with Commission regulations.

7. This paragraph can neither be admitted nor denied since it contains matters which petitioners would present at hearing rather than factual averments. However, as a reply to these matters, PECO would aver that, (a) the necessity for this line is described in the Letter of Notification; (b) the alleged risk of health hazard from EMF fields is a matter which this Commission has the expertise to address with its knowledge of the subject and the recent decisions on this issue from various agencies and courts in other jurisdictions, together with the knowledge of the ongoing research in this field; and (c) this Commission has plenary jurisdiction over the safety of this line and from its expertise in this area, is thoroughly versed on all aspects relating to safety of transmission lines. Finally, any material that could be presented on reduction of property values goes to issues that are beyond the jurisdiction of this Commission.

8. Denied. This paragraph is a repeat of paragraph 3. Rather than repeat PECO's response to petitioners' erroneous characterization of PECO's Letter of Notification, PECO

incorporates by reference the Letter of Notification which will speak for itself in answer to this paragraph.

9. Denied. This paragraph has no relevance to this proceeding. The notice of the filing of the Letter of Notification given to all municipalities traversed by the line, which notice is expressly admitted by petitioners, is not for the purposes of local zoning but to fulfill the service requirement of the Commission regulations.

10. Denied that PECO violated the rules of the Commission in filing its Letter of Notification. The balance of this paragraph relating to alleged "inverse condemnation" is a matter for the courts and beyond the jurisdiction of this Commission.

11. Denied. PECO has attempted to answer petitioners' questions regarding construction of the transmission line by attendance at a public meeting or meetings.

The service date of the transmission line is the summer of 1991. Construction of the line must continue in order to meet this service date. Petitioners have not alleged any new evidence which they would present, merely the typical allegations or concerns regarding safety, aesthetics, interference with reception, potential for fires, reduction of property values and health effects. All of these matters have been explored time and time again in all transmission line cases. There is nothing new in petitioners' offer to present various issues. This Commission has the expertise to decide these matters.

If there is a "taking" of property rights as alleged by the petitioners, the courts are open to them. This proceeding should not be reopened nor should construction be stopped by this Commission based on this allegation.

The location of PECO's Woodbourne-Heaton 230 kV transmission line within the confines of Conrail railroad right-of-way and on structures which have carried 138,000 volt transmission facilities in the past is a natural use of the corridor methodology to which this Commission has subscribed in the past. See petitions of PECO at Dockets P-810309, P-870228 and P-880293. PECO has extant literally hundreds of miles of transmission lines along the rail corridors in its territory. These corridors are the "natural highways" for PECO's transmission lines. Some rail corridors carry more than one PECO line and many carry not only PECO transmission lines but also the railroad's electric transmission facilities as well as the catenary facilities to operate the trains.

In PECO's highly urbanized territory, it has become more and more apparent that new transmission line corridors are a thing of the past. Accordingly, PECO's efforts to locate transmission lines looks increasingly to rail corridors, such as Conrail's corridor in the instant case. Railroads are like highways in the sense that highways and streets are used to carry electric distribution lines to the homes, rail corridors are used to deliver bulk power to substations from whence the power is

carried in distribution lines on the streets and highways. To deprive the public of the use of these rail corridors to carry the bulk power would place the public's electric service in serious jeopardy.

WHEREFORE, it is respectfully requested that the Emergency Petition to intervene, reopen and suspend be denied.

Respectfully submitted,

Donald Blanken

Donald Blanken, Esquire
Attorney for
Philadelphia Electric Company
2301 Market Street
Philadelphia, PA 19101

COMMONWEALTH OF PENNSYLVANIA :
: SS.
COUNTY OF PHILADELPHIA :

DONALD BLANKEN, Esquire, being duly sworn according to law, deposes and says that he is Assistant General Counsel of Philadelphia Electric Company; that he is authorized to and does make this affidavit for it; and that the facts as set forth above are true and correct to the best of his knowledge, information and belief, and he expects the said Philadelphia Electric Company to be able to prove the same at any hearing hereof.

Donald Blanken
DONALD BLANKEN

Sworn to and Subscribed
before me this 18th day
of September, 1990.

Rosemary P. McNulty

NOTARIAL SEAL
ROSEMARY P. McNULTY, Notary Public
City of Philadelphia, Phila. County
My Commission Expires Nov. 23, 1992

BEFORE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

| | | |
|---|---|---|
| Letter of Notification of Philadelphia Electric Company relative to reconductoring and rebuilding of the existing 138 kV line to operate as a Woodbourne-Heaton 230 kV line, in Montgomery and Bucks Counties. | : | A-110550F055 |

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of Philadelphia Electric Company's Answer to Emergency Petition of Non-Noticed Property Owners to Intervene, for Reopening and to Suspend Approval in the above matter upon the following by mailing a copy thereof First Class Mail, properly addressed and postage prepaid to:

Robert J. Sugarman, Esquire
Sugarman & Associates
16th Floor, City Place
101 North Broad Street
Philadelphia, PA 19107

Dated at Philadelphia, Pennsylvania, this 18th day of September 1990.

Donald Blanken

Donald Blanken, Esquire
Counsel for
Philadelphia Electric Company
2301 Market Street
Philadelphia, PA 19101

ROY REINARD, MEMBER
DISTRICT OFFICE:
120 BUCK ROAD, SUITE 202
HOLLAND, PENNSYLVANIA 18966
PHONE (215) 364-3414

HARRISBURG OFFICE
P O BOX 5
MAIN CAPITOL BUILDING
HARRISBURG, PENNSYLVANIA 17120-0028
PHONE (717) 787-9033

COMMITTEES
RLS
CONSERVATION
INSURANCE
FINANCE
COMPUTER SERVICES

HOUSE OF REPRESENTATIVES
COMMONWEALTH OF PENNSYLVANIA
HARRISBURG

A-110550F055

DUPLICATE RECORD.
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

October 2, 1990

RECEIVED
OCT 2 1990
SECRETARY'S OFFICE
Public Utility Commission

Jerry Rich
Secretary's Bureau
PA Public Utility Commission
G-18 North Office Building
Harrisburg, PA 17120

Dear Mr. Rich:

I am writing to you concerning the actions the PUC took on February 1, 1990, approving Philadelphia Electric Company's Letter of Notification to increase a 138,000 volt power line to a 230,000 volt power line. This power line runs from Montgomery County through Northampton, Southampton, and Middletown Townships in Bucks County. I have been contacted by many residents as well as township officials regarding concerns with this installation.

Parents Against an Unsafe Environment (PAUSE) has submitted an emergency petition to appeal the February 1 approval. There have been many complaints circulating because the PUC did not have a public hearing on the issue. Everyone is now aware of the fact that comments and objections to the proposed line could have been presented to the PUC, but this was not made aware to them prior to the PUC's approval. PE's copy of its Letter of Notification filed with the PUC was sent to the affected governing bodies, but there was no explanation set with it. Specifically in my case, no Letter of Notification was sent to my attention.

At this point in time, with studies indicating possible adverse health effects caused by electromagnetic fields (EMFs), I believe it is necessary to make the public aware and allow public participation when considering such an installation of a high voltage transmission line. Ongoing studies being conducted now on EMFs will help us determine the true effects of living and working near EMFs, but until then the situation should not be ignored. If it is,

DOCKETED
OCT 17 1990

it will only be a disservice to the public and cause more public outcry.

I would appreciate your prompt attention in reviewing the emergency appeal of PAUSE and I remain anxious for your positive ruling for a public hearing.

Sincerely,

ROY REINARD
State Representative
178th Legislative District

RR:ams

cc Edward Koerper
Frank and Dorothy English
Lower Southampton Township Board of Supervisors

10/4/90 - copy of ltr sent to: Chairman's Office
Dir.Operations
CEEP - T. Prowell
Law Bureau
mpk

PENNSYLVANIA PUBLIC UTILITY COMMISSION.
Uniform Cover and Calendar Sheet



| | |
|---|---|
| 1. REPORT DATE: October 18, 1990 | 2. BUREAU AGENDA NO. OCT-90-L-734* |
| 3. BUREAU: Law | |
| 4. SECTION(S): Fixed Utility Service | 5. PUBLIC MEETING DATE: November 21, 1990 |
| 6. APPROVED BY: Director: J. Povilaitis 7-5000<br>Supervisor F. Wilmarth 3-2810 | |
| 7. MONITOR: | |
| 8. PERSON IN CHARGE: Patricia Krise Burket 3-2810 | |
| 9. DOCKET NO: A-110550F055 | |

10. (a) CAPTION (abbreviate if more than 4 lines)
(b) Short summary of history & facts, documents & briefs
(c) Recommendation

(a) Emergency Petition of Non-Noticed Property Owners to Intervene for Reopening and to Suspend Approval.

(b) On September 14, 1990, Petitioners Robert Small, Frank English, Diane P.S. Koerper, et al., members of the non-profit corporation P.A.U.S.E., filed a petition requesting that the Commission reconsider its final order, entered February 9, 1990 at A-110500F055, which approved the Letter of Notification filed by Philadelphia Electric Company (PECO) to reconstruct a former Conrail transmission line as the Woodbourne-Heaton 230 kV line in portions of Montgomery and Bucks Counties. The petition also requested that the Commission reopen the proceeding and allow the Petitioners to intervene, and that the Commission suspend its approval of authority to PECO to reconstruct this line. On September 18, 1990, PECO filed an answer to this petition and requested that it be denied.

(c) The Law Bureau recommends adoption of an order which denies the petition.

11. MOTION BY: Commissioner Rhodes — Commissioner Chm. Smith - Yes; Commissioner Rolka - Yes
SECONDED: Commissioner Fischl — Commissioner

CONTENT OF MOTION: Postponement to December 6, 1990 for further review by the Commission.

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JAN 24 1991

DOCUMENT FOLDER

SUGARMAN & ASSOCIATES

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16TH FLOOR, CITY PLACE
101 NORTH BROAD STREET
PHILADELPHIA, PENNSYLVANIA 19107
215-751-9733
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202-887-5858

ROBERT J. SUGARMAN
ALAN M. KAPLAN
MARCIA E. BERRY

ROBERT RAYMOND ELLIOTT, P.C.*
COUNSEL

CONNIE A. BARNDT
LEGAL ASSISTANT

*NOT ADMITTED IN PA.

ORIGINAL

DOCKETED

JAN 07 1991

December 19, 1990

DUPLICATE RECORD.
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT.

RECEIVED

DEC 27 1990

SECRETARY'S OFFICE
Public Utility Commission

Mr. Jerry Rich
Secretary
Pennsylvania Public Utility
Commission
P. O. Box 3265
Harrisburg, PA 17120

Re: Application of Philadelphia Electric Company; A-110550-F055
Emergency Petition to Reopen

Dear Mr. Rich:

I am writing to supplement the Emergency Petition which we filed on or about September 10, 1990, on behalf of over 100 affected property owners requesting reopening of the above-mentioned matter, because the case was wrongly treated as a notification matter, and no notice was given to any of the affected citizens. The Petition has been supported by numerous public officials and townships, all of whom have entrusted the oversight of these matters to the Public Utility Commission, and are supporting the affected owners request for their most fundamental right, opportunity to be heard prior to being affected in this serious fashion. A corrected copy of the petitioners list (to correct typographical errors) is attached hereto as Exhibit A.

We previously pointed out that the entire line was mischaracterized as a reconstruction and enlargement, whereas in fact it is a new line to PECO. In addition to the previous grounds, we have now learned that the representations by PECO as to extent of new right-of-way (not ever used by anyone) are not accurate. Contrary to PECO, at the far eastern end of the proposed facility, the right-of-way departs from the Conrail right-of-way and proceeds several hundred feet north perpendicular to the right-of-way on totally new right-of-way. It then turns another right angle to the east and proceeds at least 900 feet on totally new right-of-way. In doing so, the line passes within 40 feet of an employee occupied building.

FOLDER

This is contrary to PECO's statement in its opposition to our Petition, as well as the original description provided by PECO.

Since our Emergency Petition was filed in September, PECO has redoubled its construction efforts, and is working seven days a week in many cases to make the line a fait accompli. We think this is inconsistent with the preapproval approach underlying the Commission's regulations, as well as PECO's statement that electromagnetic force is a societal issue.

We respectfully call to the Commission's attention the EPA Report on electromagnetic risk, now being released in Washington. (Article attached as Exhibit B.) We ask that the Commission permit us a timely hearing on this serious issue in accordance with the Regulations.

We therefore respectfully urge the Commission to take prompt and positive action to order PECO to stop construction or to put it on notice that it is proceeding at its own risk, and to order an opportunity for the affected people to be heard.

Respectfully submitted,

ROBERT J. SUGARMAN
Counsel for Petitioners

RJS:er

cc: PUC Commissioners
Interested Public Officials
PECO

rjs90/282

# EPA report delayed by White House

By Paul Raeburn
Associated Press

An Environmental Protection Agency report suggesting a link between electromagnetic fields and leukemia and brain cancer in children will be released next week after being held up by the White House science adviser, the EPA said yesterday.

Some EPA scientists said the White House was wrong to delay the report. But the White House science adviser's office told the agency that it was concerned that the report would alarm the public, EPA officials said.

Similar reservations were expressed by James Mason, assistant secretary of health, the EPA officials said.

"They were concerned not about the accuracy of the report," said Robert McGaughy, who supervised the report's preparation. "They were concerned about how people would react to the news. There is a concern that people will take too seriously the suggestions that there may be some connection with cancer."

Neither the White House science adviser — D. Allan Bromley — nor Mason was available for interviews yesterday, their offices said.

The report looked at all kinds of electromagnetic fields, from those produced by high-power electrical transmission lines to those produced by household appliances.

Virtually everyone is exposed to such fields every day.

Epidemiological, or statistical, studies have linked residential exposures to cancer in children and occupational exposures to cancer in adults, said David Savitz of the University of North Carolina in Chapel Hill, the author of one of the most important of those studies.

Laboratory studies have suggested that living cells can respond to electromagnetic fields, and researchers have hypotheses as to why the fields might theoretically cause cancer, he said.

"There are credible scientific suggestions of adverse health effects from these exposures, but the overall body of evidence is not conclusive," said Savitz.

The EPA report is a review of all existing studies on electromagnetic fields and cancer. A draft prepared last summer concluded that the studies "show a consistent pattern of response which suggests, but does not prove, a causal link" between household power distribution systems and certain cancers in children.

The children's cancers were leukemia, brain cancer and lymphoma, the report said.

The draft has been revised once, but "our current conclusions are very similar," McGaughy said.

David Bayliss, one of the authors, said he was frustrated by the delay in

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DEC 27 1990
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Public Utility Commission

PETITIONERS

| | |
|---|---|
| Robert M. Andrassy | 597 Valley View Road<br>Langhorne, PA 19047 |
| Anna Benedetto | 1400 Clover Lane<br>Feasterville, PA 19053 |
| Alfredo Benedetto | 1400 Clover Lane<br>Feasterville, PA 19053 |
| Marie Burnell | 625 Valley View Raod<br>Langhorne, PA 19047 |
| George Charokopas | 1108 Renee Circle<br>Feasterville, PA 19053 |
| Zena Charakopas | 1108 Renee Circle<br>Feasterville, PA 19053 |
| Mauro Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Teroloni Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Eligio Cieri | 1504 Grace Circle<br>Feasterville, PA 19053 |
| Lois Cohen | 1337 Roberts Avenue<br>Feasterville, PA 19053 |
| Lynn E. Cohen | 1509 Grace Circle<br>Feasterville, PA 19053 |
| Frank Cohen | 1337 Roberts Avenue<br>Feasterville, PA 19053 |
| William Cohen | 1509 Grace Circle<br>Feasterville, PA 19053 |
| Karen Dalrymple | 583 Valley View Road<br>Langhorne, PA 19047 |
| Elizabeth G. Dever | 540 Valley View Road<br>Langhorne, PA 19047 |
| Rosemarie Dilliplane | 18 Wychwood Lane<br>Langhorne, PA 19047 |
| John Dilliplane | 18 Wychwood Lane<br>Langhorne, PA 19047 |

| | |
|---|---|
| Margaret Dontas | 1116 Renee Circle<br>Feasterville, PA 19053 |
| Gus Dontas | 1116 Renee Circle<br>Feasterville, PA 19047 |
| Frank English | 239 W. Bristol Road<br>Feasterville, PA 19053 |
| Dorothy English | 239 W. Bristol Road<br>Feasterville, PA 19053 |
| Linda M. Engle | 634 Doas Ct.<br>Langhorne, Pa 19047 |
| Arthur J. Edzrodt | 621 Valley View Road<br>Langhorne, PA 19047 |
| Alan M. Fallick | 521 Valley View Road<br>Langhorne, PA 19047 |
| Judith S. Fallick | 521 Valley View Road<br>Langhorne, PA 19047 |
| Linda & George Henry | 508 Militia Hill Road<br>Southampton, PA 18966 |
| Edward F. Koerper, Jr. | 300 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Thomas J. Wing, Jr. | 1113 Renee Circle<br>Feasterville, PA 19053 |
| Edward L. Graeber | 505 Valley View Road<br>Langhorne, PA 19047 |
| Allen Shore | 1112 Renee Circle<br>Feasterville, PA 19053 |
| Joseph A. Nerlinger | 1361 Clover Lane<br>Feasterville, PA 19053 |
| William I. Kase | 1350 Clover Lane<br>Feasterville, PA 19053 |
| Virginia B. Kase | 1350 Clover Lane<br>Feasterville, PA 19053 |
| Kenneth E. King | 650 Doas Court<br>Langhorne, PA 19047 |

| | |
|---|---|
| Diane P.S. Koerper | 556 Militia Hill Road<br>Southampton, PA 18966 |
| Jacinta M. Koerper | 300 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Scott Koerper | 556 Militia Hill Raod<br>Southampton, PA 18966 |
| Mae Kwasinski | 1360 Clover Lane<br>Feasterville, PA 19053 |
| Walter Kwasinski | 1360 Clover Lane<br>Feasterville, PA 19053 |
| Michael C. Lawler | 1513 Grace Circle<br>Feasterville, PA 19053 |
| Margaret E. Lawler | 1513 Grace Circle<br>Feasterville, PA 19053 |
| Claudia Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Annamaria Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Tina Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Samuel Lepore | 1505 Grace Circle<br>Feasterville, PA 19053 |
| Dennis Trijillo, M.D. | 550 Valley View Road<br>Langhorne, PA 19047 |
| Maryjane McHugh | 550 Valley View Road<br>Langhorne, PA 19047 |
| Ruth Mebs | 548 Militia Hill Road<br>Southampton, PA 18966 |
| Maryellen F. Morgan | 1109 Renee Circle<br>Feasterville, PA 19053 |
| Richard L. Morgan | 1109 Renee Circle<br>Feasterville, PA 19053 |
| Judy Nerlinger | 1361 Clover Lane<br>Feasterville, PA 19053 |

| | |
|---|---|
| Janis E. Peregay | 1380 Clover Lane<br>Feasterville, PA 19053 |
| Francine G. Peregay | 1380 Clover Lane<br>Feasterville, PA 19053 |
| Tony Poulos | 1501 Grace Circle<br>Feasterville, PA 19047 |
| Karen Poulos | 1501 Grace Circle<br>Feasterville, PA 19047 |
| Steven M. Seder | 1105 Renee Circle<br>Feasterville, PA 19047 |
| John & Pat Princevalli | 532 Militia Hill<br>Southampton, PA 18966 |
| Traci Princevalli | 532 Militia Hill<br>Southampton, PA 18966 |
| Meryl Seder | 1105 Renee Circle<br>Feasterville, PA 19053 |
| Harry C. Senopoulos | 1120 Renee Circle<br>Feasterville, PA 19053 |
| Robert Small | 15 Wychwood Lane<br>Langhorne, PA 19047 |
| Jill Small | 15 Wychwood Land<br>Langhorne, PA 19047 |
| James J. Stevenson | 290 Casey Circle<br>Huntingdon Valley, PA 19006 |
| George E. Stewart, Jr. | 639 Daos Court<br>Langhorne, PA 19047 |
| Dorothy N. Stevenson | 290 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Arthur F. Swanson | 1101 Renee Circle<br>Feasterville, PA 19053 |
| Noreen F. Swanson | 1101 Renee Circle<br>Feasterville, PA 19053 |
| Claudia J. Wallick | 1140 Renee Circle<br>Feasterville, PA 19053 |
| Hara Wagman | 1117 Renee Circle<br>Feasterville, PA 19053 |

| | |
|---|---|
| Alan M. Wagman | 1117 Renee Circle<br>Feasterville, PA 19053 |
| Earl Weiss | 281 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Elizabeth Weiss | 281 Casey Circle<br>Huntingdon Valley, PA 19006 |
| Inge A. Wing | 113 Renee Circle<br>Feasterville, PA 19053 |
| Maria Yanness | 522 Valley View Road<br>Langhorne, PA 19047 |

RJS90\304

CERTIFICATE OF SERVICE

I, Robert J. Sugarman, certify that I have mailed a copy of the foregoing supplemental letter to the following counsel by first class mail postage pre-paid on this date:

Donald Blanken, Esquire
Philadelphia Electric Company
Legal Department
2301 Market Street
Philadelphia, PA 19101

ROBERT J. SUGARMAN

Date: 12/17/93

rjs90/297

# PHILADELPHIA ELECTRIC COMPANY

ORIGINAL AMH

LEGAL DEPARTMENT


James W. Durham
Senior Vice President
and General Counsel

Eugene J. Bradley
Of Counsel

Bjarnie R. Anderson
Legal Administrator

2301 MARKET STREET, BOX 8699
PHILADELPHIA, PA 19101
(215) 841-5544 FAX: 568-3389

Paul Auerbach
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Rudolph A. Chillemi
T. H. Maher Cornell
Edward J. Cullen, Jr.
Katherine K. Dodd
Aubra S. Gaston
E. C. Kirk Hall
J. Lindsay Johnston
Kimberly Lewis
T. Michael Mather
Assistant General Counsel



DUPLICATE RECORD:
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

JAN 09 1991


January 2, 1991


RECEIVED
JAN - 2 1991
SECRETARY'S OFFICE
Public Utility Commission


Mr. Jerry Rich, Secretary
Pennsylvania Public Utility Commission
P. O. Box 3265
Harrisburg, PA 17120

Re: Letter of Notification of Philadelphia Electric Company relative to reconstruction and rebuilding of the existing 138 kV line to operate as a Woodbourne-Heaton 230 kV line, in Montgomery and Bucks Counties. - A-110550F055

Dear Mr. Rich:

On December 26, 1990, Philadelphia Electric Company (PECO) received a copy of a supplement to an Emergency Petition to reopen the subject proceeding.

Petitioners, again, accuse PECO of mischaracterizing the proposed project as a "reconstruction and enlargement." PECO can, unfortunately, not think of a better, clearer, more accurate way to describe the project in the English language than as it was described to the P.U.C. and all the municipalities through which it traverses, as ". . . a proposed rebuilding of and reconductoring of an ABANDONED 138 kV transmission line." PECO's Letter of Notification described all of the abandoned railroad facilities to be removed from the supporting structures and the new facilities to be installed by PECO. PECO also fully described in its Letter of Notification that it had purchased property (about two acres) which lay between its Woodbourne Substation and the railroad and that this property would "be used to divert the line from the railroad into the substation . . ."

In regard to the issue of electromagnetic risk from the line raised by Petitioners, I have enclosed copies of recent decisions from the New Jersey, Colorado and Maryland Public Service Commissions. These decisions all permitted the construction of the electric power lines after exhaustively reviewing the medical evidence relative to the alleged health hazards associated with electromagnetic fields.

The New Jersey decision, issued July 12, 1990, is most relevant since this Commission declined to rehear the case despite petitioners' allegations of health hazards.

Accordingly, it is respectfully submitted that petitioners have shown no valid reason why this record should be reopened.

Very truly yours,

Donald Blanken

Donald Blanken

DB:bmt
Enclosures

cc: PAPUC Commissioners
Robert Sugarman, Esquire
Public Officials

STATE OF MARYLAND
PUBLIC SERVICE COMMISSION

ORDER NO. 68784

| | |
|---|---|
| IN THE MATTER OF THE APPLICATION OF POTOMAC ELECTRIC POWER COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF A 500 KV OVERHEAD TRANSMISSION LINE FROM THE BRIGHTON SUBSTATION IN MONTGOMERY COUNTY, TO THE VICINITY OF BALTIMORE GAS AND ELECTRIC COMPANY'S HIGH RIDGE SUBSTATION IN HOWARD COUNTY, MARYLAND. | BEFORE THE PUBLIC SERVICE COMMISSION OF MARYLAND<br><br>CASE NO. 7004 |

## I. INTRODUCTION

The matter of the application of Potomac Electric Power Company ("PEPCO" or "Company") for a certificate of public convenience and necessity for the construction of a 500 kV overhead transmission line from the Brighton Substation in Montgomery County to the vicinity of Baltimore Gas and Electric Company's High Ridge Substation in Howard County, Maryland, is once again before the Commission. The procedural history of this case is quite extensive and is set forth in the Proposed Order; therefore, it will not be recounted here.

The instant proceeding was initiated when on February 4, 1988, the Brinkwood Community Association, Inc. ("BCA"), a party to the original proceeding, filed with the Commission a Request For Rehearing to Receive New Evidence. The BCA petition averred that since the conclusion of the hearings in Case No. 7004, new scientific and medical evidence concerning the safety and health effects of (primarily) magnetic fields associated with high voltage transmission lines has come to light. On

February 22, 1988, PEPCO filed a response to BCA's petition and indicated if Case No. 7004 were reopened, the record to be developed would show there was no new evidence which would warrant any modification of the Certificate of Public Convenience and Necessity. Nevertheless, PEPCO stated that it supported BCA's request to reopen Case No. 7004 and to provide the parties with an opportunity to present additional evidence concerning possible electromagnetic effects resulting from the operation of the Brighton-High Ridge line.

By Order No. 67998, the Commission reopened Case No. 7004,

> for the purpose of receiving and considering evidence . . . on the limited issue of the safety and health effects, if any, associated with the electromagnetic field resulting from the operation of the certificated 500 kV line to be located between the Brighton and High Ridge substations. No other issue previously decided by Order No. 64227, or any other issue -- whether or not capable of having been raised during the prior hearings in Case No. 7004 -- except for the limited issue described above, shall be raised during the reopened proceeding. Re Potomac Electric Power Company, 79 Md. P.S.C. 80, 82 (1988).[1]

The matter was delegated to the Hearing Examiner Division and a prehearing conference in the reopened case was held on July 8, 1988. The following parties, who participated in the initial proceeding, entered their respective appearances: PEPCO, the Commission Staff ("Staff"), the Office of People's

[1] Order No. 64277 was issued by the Commission on March 5, 1980, wherein the Commission adopted the findings of the Hearing Examiner. See, Potomac Electric Power Company, 71 Md. P.S.C. 68 (1980).

Counsel ("OPC"), the Department of Natural Resources ("DNR"), Howard County ("HC"), and Baltimore Gas and Electric Company ("BG&E"). In addition, Maple Lawn Farms, Inc. ("MLF") and 10 property owners appearing pro se were granted leave to intervene in the reopened case. The BCA chose not to retain counsel in this matter and, thus, did not intervene as a party. However, various property owners in the Brinkwood community were among those who were granted leave to intervene pro se.

Hearings on the limited issue specified by the Commission were held on March 27 through March 31, 1989. Initial Briefs were filed on April 26 with Reply Briefs on May 12, 1989.

PEPCO presented the testimony of eight expert witnesses. Testifying were: William F. Trapp, Manager of PEPCO's System Planning Department; J. Michael Silva, a transmission line engineer and president of ENERTECH Consultants; Edwin L. Carstensen, Professor of Engineering and Professor of Biophysics at the University of Rochester; Dr. H. Dwight Mercer, a veterinarian and comparative toxicologist and Dean of the College of Veterinary Medicine of Mississippi State University; Dr. Mark Israel, a pediatric oncologist and cancer researcher and Chief of the Molecular Genetics Section of the Pediatric Branch in the Division of Cancer Treatment at the National Cancer Institute (National Institutes of Health); Dr. Margaret A. Tucker, a physician and cancer epidemiologist, and Chief of the Family Studies Section of the Environmental Epidemiology Branch at the National Cancer Institute; Dr. Roswell K. Boutwell, an Emeritus Professor of Oncology at the University of Wisconsin, a

cancer researcher at the McArdle Laboratory for Cancer Research, and a member of the National Cancer Advisory Board (which oversees the National Cancer Institute); and Dr. Richard Bockman, Associate Professor of Medicine and Associate Professor of Biochemistry at the Cornell University Medical College.

Testifying on behalf of DNR/Staff was Thomas E. Magette, Manager of Nuclear Programs for the Maryland Power Plant and Environmental Review ("PPER") Division of DNR. In addition, Dr. J. Patrick Reilly, an electrical engineer with the Johns Hopkins University Applied Physics Laboratory and president of Metatec Company, and Dr. William H. Bailey, a research scientist with Environmental Research Information, Inc. and a visiting research scientist at the Cornell University Medical College, also testified for DNR/Staff.

The Office of People's Counsel sponsored the testimony of Dr. Charles Polk, Professor of Electrical Engineering at the University of Rhode Island and president of the Bioelectromagnetics Society.

Howard County presented the testimony of Dr. Jerry L. Phillips, a biochemist at the Cancer Therapy and Research Foundation of South Texas and an Adjunct Professor of Medicine in the Division of Oncology at the University of Texas Health Science Center.

In addition to the expert witnesses, several property owners and residents of the area through which the transmission line would traverse made statements for the record.

A complete, accurate and exhaustive summary of all the witnesses' testimony and the evidence presented is provided in the Proposed Order and will not be repeated here.

It should be noted, however, that during the course of the reopened proceeding, testimony and evidence was presented that addressed: (1) electric transmission lines in general and the Brighton-High Ridge line in particular; (2) the properties of electric fields and magnetic fields; and (3) laboratory studies and epidemiological studies which have been conducted to investigate possible associations between electric and/or magnetic fields and adverse health effects.

At the conclusion of the evidentiary hearing, the Hearing Examiner ruled that the expert witnesses in this case agree that a causal relationship has not been established between exposure to electric and/or magnetic fields and adverse health effects. She also rejected suggestions to expand the right-of-way of the line, redesign the line configuration, or set a magnetic field limit within homes along the transmission lines' routes, for such action appears to be arbitrary and perhaps counterproductive.[2]

The Hearing Examiner adopted DNR/Staff's recommendation that PEPCO be allowed to proceed with construction of the

[2] In her Proposed Order the Hearing Examiner notes that it is inappropriate to set standards for magnetic fields or rights-of-way when there is no scientific basis to support said standards. Further, in support of her ruling, she cites the testimony of OPC witness, Dr. Polk, that given the possibility of "window effects," establishing standards that are intended to decrease fields may in fact cause an adverse effect in another window.

Brighton-High Ridge line with the Commission monitoring new scientific evidence on the issue of health effects from exposure to power lines.

On January 23, 1990, the Commission received correspondence from Maple Lawn Farms, Inc. requesting the Commission not to grant PEPCO the right to build the 500 kV line. On February 1, 1990, OPC filed a Memorandum of Appeal and on February 2, 1990, Mr. and Mrs. Roscoe C. Born and Mr. and Mrs. Robert M. Murch ("Born/Murch") also filed a Memorandum of Appeal. Reply Memorandums were filed by PEPCO, Howard County and Staff/DNR.

On March 2, 1990, Born/Murch filed a Petition for Redress and on March 9, 1990, DNR/Staff filed a Response to Appellants' Petition for Redress.

It is in regard to the above-noted appeals of the Hearing Examiner's decision that we are now called upon to review and render a decision.

## II. Discussion

### A. Evidence

On appeal Born/Murch (Intervenors pro se) and Howard County challenge the Hearing Examiner's ruling on the admissibility of hearsay evidence and the sufficiency of the record evidence. To place these arguments in proper perspective, it should be noted that on December 20, 1988, Born/Murch filed with the Commission a statement which was accompanied with three documents. The three documents attached were: Biological

Effects of Power Line Fields, the Final Report of the Scientific Advisory Panel of the New York State Power Lines Project, July 1, 1987; Health Effects of Transmission Lines, Oversight Hearing before the Subcommittee on Water and Power Resources of the House Committee on Interior and Insular Affairs, 100th Congress (October 6, 1987); and Biological Effects from Electric and Magnetic Fields, Air Ions and Ion Currents Associated with High Voltage Transmission Lines, project resumes by researchers at a Contractors Review symposium sponsored by the United States Department of Energy and the Electric Power Research Institute in November 1987. Born/Murch requested that these documents be made part of the record.[3]

By an order issued March 20, 1989, the Hearing Examiner admitted into evidence the report of the Scientific Advisory Panel of the New York State Power Lines Project; however, she ruled that the other reports would not be received into evidence.[4]

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[3] On February 4, 1988, the Brinkwood Community Association filed a Request for Rehearing to Receive New Evidence. Attached to the request were the three documents Born/Murch wishes to have become part of the record evidence. By Order No. 67998 we declined to take judicial notice of the set of documents. Re Potomac Electric Power Co. 79 Md. PSC 80 (1988).

[4] The Hearing Examiner admitted into evidence the NYSPLP report. However, she rejected the inclusion of the other two reports for reasons fully explained in her 12-page written ruling, with which the Commission concurs.

It is Born/Murch's position that the record in this proceeding is incomplete and that the Commission has failed to comply with the dictates of The PSC Law.[5] Specifically, they argue that the Staff's and Commission's failure to obtain the direct testimony of the scientists cited in the proffered research reports, and to consult with these scientists in its decision making, resulted in a grossly incomplete record. It is their opinion that the Commission ". . . should have constructed a comprehensive list of scientists and investigators working in this field, then consulted them in hearings or by deposition to obtain their reports of their findings. These, then, could have been subjected to impartial scrutiny by medical, scientific, or technical advisers . . . ." (Born/Murch Memorandum on Appeal at 11) In the same vein as the above-noted argument, Born/Murch contend that the Commission's refusal to take judicial notice of the research documents led to an incomplete record. In an attempt to clarify its request for judicial notice, Born/Murch assert that:

> BCA does not request that the Commission, at this time, take judicial notice that the statements of these scientists and investigators are correct -- only that these are the views and findings of these scientists and investigators, who could be expected to so testify if called as witnesses in a rehearing of this case.

They believe that the Commission's refusal to receive the statements or the testimony of these particular scientists constituted a dereliction of duty.

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[5] Article 78, Maryland Annotated Code (Cum. Supp. 1988).

Echoing the same argument as Born/Murch, Howard County[6] in its Reply Memorandum asserts that, ". . . the Commission has less than the best available evidence before it and that it would have been preferable for the Commission to hear from the experts conducting research in the area." (Howard County Reply Memorandum at 6) Further, the County believes that the Hearing Examiner's decision to preclude the inclusion of the two documents within the record evidence was "inappropriate and needlessly stringent." (Id. at 4)

In reply, PEPCO contends that the Proposed Order of Hearing Examiner is based on a complete evidentiary record. PEPCO points out that 12 expert witnesses provided extensive testimony documenting the full range of anticipated field levels for the Brighton-High Ridge Line.

On the issue of whether electric and/or magnetic fields cause or promote cancer, PEPCO notes that the record contains the testimony of one of the world's leading cancer researchers who was appointed to the National Cancer Advisory Board by the President. The record also contains the testimony of a cancer epidemiologist and a pediatric oncologist both from the National Cancer Institute. Regarding field levels and related exposure issues, the record contains the testimony of one of the nation's leading experts on electric and magnetic field exposure assessment. A nationally recognized expert addressed the

[6]While Howard County did not appeal the Proposed Order, it did file a Reply Memorandum which agreed with the arguments raised by People's Counsel and Born/Murch.

research on immunology and endocrinology. (PEPCO Reply Memo at 12)

While Born/Murch refer to studies of Savitz, Adey, Goodman and Tomenius in claiming that the record is incomplete, PEPCO counters that the Hearing Examiner considered every facet of the Savitz study in her Proposed Order. PEPCO maintains that the Hearing Examiner appropriately found that the studies of Adey and Goodman do not provide a basis for a finding of adverse health effects. In addition, PEPCO states that there is abundant evidence, including Born/Murch's own exhibit, to show that Tomenius reported a drop in cancer risk as magnetic field levels increased. (Id.)

Finally, PEPCO points out that DNR/Staff did a thorough independent assessment of the research. PEPCO concludes that there is no basis to claim that the record is anything but complete. (Id. at 13)

DNR/Staff categorically deny that there is any validity to the unsupported accusations of the Borns and Murches concerning the evidence in the record. DNR/Staff argue that the record clearly demonstrates that all available information on health effects and electromagnetic fields has been exhaustively considered.

In deciding these issues, we have carefully considered all of the testimony, evidence and arguments advanced by the parties. Our review of the record evidence reveals that the Hearing Examiner received testimony and reports from expert witnesses that addressed: (1) electric transmission lines in

general and the Brighton-High Ridge line in particular; (2) the properties of electric fields and magnetic fields; and (3) laboratory studies and epidemiological studies which have been conducted to investigate possible associations between electric and/or magnetic fields and adverse health effects. The review of laboratory and epidemiological studies concerning the topic addressed by the various witnesses consisted of a vast number of studies conducted in this field. During the course of these proceedings, these studies were reviewed, critiqued, analyzed and challenged. The Hearing Examiner in her Proposed Order painstakingly addressed the studies and provided sound reasonings for her acceptance or rejection of the conclusions of certain studies. The Hearing Examiner not only reviewed the studies conducted by various researchers and scientists in the field, but also considered reports produced by witnesses participating in this case.

We believe that the testimony, documents, and reports produced in this case provided a sound basis for the Hearing Examiner's findings which we adopt as our own. The argument advanced by Born/Murch that the best evidence was not available overlooks the fact that the record evidence included testimony of expert witnesses who have experience in the areas of engineering, physics, genetics, oncology, epidemiology, teratology, endocrinology and immunology; and that these witnesses were in fact made available for cross-examination. The Commission finds that the parties presented extensive evidence to address the

issue presented herein; therefore, we conclude that Born/Murch's argument that the record is incomplete is without merit.

The Commission also rejects Born/Murch's argument, supported by Howard County, that the Hearing Examiner erred in refusing to admit hearsay evidence in an administrative proceeding. We have reviewed the Hearing Examiner's Ruling on Evidentiary Matters issued March 20, 1989 and believe that reasoning to be sound and therefore adopt it as our own.

While the Commission is not bound by the technical rules of evidence or procedure of courts of law or equity, it must observe the basic rules of fairness as to the parties appearing before it. American Radio-Telephone Service, Inc. v. Public Service Commission, 33 Md. App. 423, 434, 365 A.2d 314 (1976). In adversary proceedings before the Commission, parties have the right of cross-examination. (Id., see also Art. 78, §82(b)) In reviewing the rights of parties before administrative agencies, Maryland courts have examined this issue and have held,

> "Perhaps the most often repeated rule of administrative law is that administrative agencies 'must observe the basic rule of fairness as to parties appearing before them.' Ottenheimer Pub. v. Employment Security Admin., 275 Md. 514, 520, 340 A.2d 701 (1974); Dickinson-Tidewater v. Supervisor, 273 Md. 245, 253, 329 A.2d 18 (1974); Rogers v. Radio Shack, 271 Md. 126, 129, 314 A.2d 113 (1974); Fairchild Hiller v. Supervisor, 267 Md. 519, 524, 298 A.2d 148 (1973). Under this fairness requirement, the right of cross-examination must be reasonably available. Hyson v. Montgomery County, 242 Md. 55, 67, 217 A.2d 578 (1965). The Court of Appeals in Hyson explained: 'The authorities seem to be in accord that when an administrative board or agency is required to hold a public hearing and to decide disputed adjudicative facts based upon evidence produced and

> a record made, that a reasonable right of cross-examination must be allowed the parties . . . The rationale of the cases and authorities is that reasonable cross-examination, which is required for a full and true disclosure of the facts, having due regard to the circumstances of each particular case, the nature of the proceedings, and the character of the rights which may be affected by it must be permitted . . . ." Tron v. Prince George's County, 69 Md. App. 256, 266-267, 517 A.2d 113 (1986).

The matter sub judice is an adversary proceeding in that the Certificate of Public Convenience and Necessity for the construction of a 500 kV transmission line has been challenged by several parties. The issue presented to the Hearing Examiner, and now the Commission, is whether this transmission line will produce adverse health effects and thus the certificate that has been granted should be changed. The parties participating in this case have presented opposing or conflicting evidence that advanced their respective positions. Thus, there are disputed adjudicative facts that must be resolved by the Commission. To admit into the record the documents proffered by Born/Murch would in essence deny PEPCO and other parties the right to cross-examine any expert witness sponsoring or relying upon the documents and would place the Company and other parties at a disadvantage. Moreover, we do not believe that the parties to this proceeding have been prejudiced by this denial, for considerable testimony and evidence from well recognized experts in their respective fields has been presented that advance differing opinions concerning the possibility of adverse health effects of transmission lines, and the evidence has been thoroughly reviewed.

We also reject the judicial notice argument advanced by Born/Murch and Howard County. As indicated in Article 78, §83(d), the ". . . Commission may take notice of judicially cognizable facts and also of general, technical, or scientific facts within its specialized knowledge." We concur with the Hearing Examiner that "[t]he proffered documents are being offered for the truth or correctness of the theories and conclusions contained therein. These theories and conclusions, while based on certain facts, are not self evident or notorious and formal proof is clearly necessary to aid the fact-finding process; they must therefore be proven and not simply 'noticed.'" (Hearing Examiner's Ruling on Evidentiary Matters, March 20, 1989, page 7) Therefore, we will again deny the request to take judicial notice of the proffered documents.

B. Prudent Avoidance

On appeal, the Office of People's Counsel maintains that though scientific evidence is inconclusive on the question whether exposure to magnetic fields produces adverse health effects, the record evidence in this proceeding reveals that there is sufficient evidence that there is "a potential human health hazard associated with long-term exposure to magnetic fields to warrant the imposition of conditions to reduce the magnetic fields produced by the proposed 500 kV transmission line." (OPC Memorandum on Appeal at 5) Given the above, OPC asserts that the Hearing Examiner erred in rejecting its proposals to reduce risk of exposure from the magnetic field.

OPC recommends that the Commission direct PEPCO to investigate the feasibility of design changes to the Brighton-High Ridge line to reduce the magnetic field strength to 10 milligauss or less at the edge of the right-of-way or in the alternative, require PEPCO to widen the right-of-way so that the field strength is 10 milligauss or less at the edge or consider rerouting the line through a less developed residential area. (Id. at 6) In support of its position, OPC notes that epidemiological and laboratory studies conducted by its witness, Dr. Polk, and Howard County witness, Dr. Phillips, conclude that electromagnetic fields pose a potential health risk. Since there is a potential harm to the public as a result of the operation of the 500 kV transmission line, OPC urges the Commission to adopt a policy of "prudent avoidance." According to OPC, "prudent avoidance" is defined as "the striking of a reasonable balance between avoiding potential harm and the attendant costs and risks.". (Id. at 9) Thus, it is OPC's opinion that in order to accomplish the goal of adopting a policy of "prudent avoidance" the Commission must adopt the conditions proffered by it.

PEPCO in reply disagrees with People's Counsel's proposals. PEPCO points out that People's Counsel has not identified any errors in the Hearing Examiner's analysis of the scientific research nor has People's Counsel identified any health effects that would be caused by the Brighton-High Ridge line. Further, PEPCO maintains that People's Counsel's view that absent "scientific certainty" the Commission is obligated to take regulatory action reflects a fundamental misconception of

scientific research and the record evidence in the case. (PEPCO Reply at 13-14)

According to PEPCO, the only basis in the record for People's Counsel's proposed 10 mG standard is a conversation that Dr. Polk once had with a scientist in Sweden. The evidence does not show a 10 mG right-of-way standard exists in Sweden or anywhere else. PEPCO asserts that there is no basis for concluding that a 10 mG standard would prevent health effects or have any positive effect at all on human health. PEPCO concludes that People's Counsel's proposed 10 mG standard is nothing more than an arbitrary field level that has no scientific basis. (Id. at 15-16)

With respect to the Colorado decision cited by People's Counsel, PEPCO believes it is consistent with the Proposed Order of the Hearing Examiner. According to PEPCO, both rulings found no basis to conclude that power line fields cause adverse health effects and in neither case were field level standards found to be warranted or appropriate. In addition, both rulings found no basis to change the proposed transmission line design or operation. (Id. at 17)

PEPCO also points out that the Brighton-High Ridge line has higher ground clearances than the National Electrical Safety Code ("NESC") requirements, larger conductors than required for the electricity load, and a reverse phasing arrangement in the Born/Murch area where it is necessary to reconstruct the existing 230 kV lines to place a fifth circuit in the existing right-of-way. Finally, the field levels from the line are generally less

than the levels from other transmission lines operating throughout the country. (Id.)

DNR/Staff agree with PEPCO that there is nothing in the record to support People's Counsel's proposed 10 mG edge-of-right-of-way standard. DNR/Staff indicate that there is nothing unique which would distinguish the proposed Brighton-High Ridge 500 kV line from any other 500 kV line in the State. (DNR/Staff Reply at 10)

According to DNR/Staff the evidence does not support the conclusion that electromagnetic fields, whether from this transmission line or any other source, cause health effects on humans, adverse or otherwise. Further, the evidence at this time does not support the conclusion that electromagnetic fields have a "significant" potential as a harmful environmental agent. (Id. at 14)

The Commission has reviewed the record evidence and the arguments advanced by the parties and agrees with the findings and reasoning of the Hearing Examiner.

The record reveals that the Brighton-High Ridge line will have ground clearances that exceed the NESC requirements; employ larger conductors than is required for the load; have reverse phasing in the area of concern to Born/Murch; use steel poles for the 500 kV line; and that the field levels emanating from the line are generally less than the levels from other transmission lines operating throughout the country. Thus, the proposed 500 kV transmission line will be constructed in a fashion that will mitigate the fields emanating from it. Since

the current scientific data shows that there is no causal relationship between electric and/or magnetic fields and adverse health, we believe that the extra measures undertaken by PEPCO to reduce the magnetic/electric fields are consistent with the theory of "prudent avoidance."7

Further, we reject OPC's recommendation that the Commission direct PEPCO to investigate the feasibility of design changes to the Brighton-High Ridge line to reduce the magnetic field strength to 10 miligauss or less at the edge of the right-of-way or in the alternative, require PEPCO to widen the right-of-way so that the field strength is 10 milligauss or less at the edge or consider rerouting the line through a less developed residential area. We are of the opinion that the record evidence reveals that there is no scientific basis for the imposition of these conditions; therefore, we do not deem it to be an appropriate measure to be adopted at this time.

IT IS THEREFORE, this 1st day of May, in the year Nineteen Hundred and Ninety, by the Public Service Commission of Maryland,

1 May 1990

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7Our finding in this case is similar and consistent with the Colorado Commission decision in In the Matter of Public Service Company of Colorado to Have Upgrades in Douglas County, Docket No. 89-A-028E, December 29, 1989, wherein the Colorado Commission found no basis to conclude that power line fields cause adverse health effects or that the proposed transmission line design or operation should be changed.

STATE OF MARYLAND
PUBLIC SERVICE COMMISSION

ORDERED: That the Proposed Order of the Hearing Examiner issued on December 21, 1989 in this proceeding is hereby affirmed.

Commissioners

PUBLIC SERVICE COMMISSION

IN THE MATTER OF THE APPLICATION OF POTOMAC ELECTRIC POWER COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF A 500 KV OVERHEAD TRANSMISSION LINE FROM THE BRIGHTON SUBSTATION IN MONTGOMERY COUNTY, TO THE VICINITY OF BALTIMORE GAS AND ELECTRIC COMPANY'S HIGH RIDGE SUBSTATION IN HOWARD COUNTY, MARYLAND. *

BEFORE THE PUBLIC SERVICE COMMISSION OF MARYLAND

RECEIVED
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RATE COUNSEL

CASE NO. 7004

## PROPOSED ORDER OF HEARING EXAMINER

Appearances:

Mary Donn Jordan, Tom Watson, and Mark Warnquist, for the Potomac Electric Power Company.

Robert H. McGowan, for the Staff of The Public Service Commission of Maryland.

Paula M. Carmody and Kirsten A. Burger, for the Office of People's Counsel.

M. Brent Hare, for the Department of Natural Resources of Maryland.

Richard E. Basehoar, for Howard County, Maryland.

Vincent M. Guida, for Maple Lawn Farms, Inc.

Charles Herndon, for Baltimore Gas and Electric Co.

Intervenors appearing Pro Se (listed in Appendix A).

On April 6, 1979, a Proposed Order of Hearing Examiner was issued in this case granting a Certificate of Public Convenience and Necessity to the Potomac Electric Power Company (PEPCO) for construction of a 500 kilovolt (kV) transmission line over a 10.5 mile route in Montgomery and

Howard Counties. Re Potomac Electric Power Company, 71 Md. PSC 73 (1980). As described in that Proposed Order, the Brighton-High Ridge line would be the final segment (in Maryland) of a 500 kV electric transmission loop around the metropolitan Washington area. (Id. at 76.)

Several parties appealed the Proposed Order which, by Commission Order No. 63763, was stayed pending further review and a determination as to whether additional proceedings were required. By Order No. 64277, issued on March 5, 1980, the Commission adopted and affirmed the Proposed Order of Hearing Examiner. Re Potomac Electric Power Company, 71 Md. PSC 68 (1980).

Three separate appeals of the Commission's Order were consolidated in the Circuit Court for Howard County. That case was held in abeyance during the pendency of separate court proceedings concerning an attempt by certain parties to depose the Commissioners. Public Serv. Commn. of Md. v. Patuxent Valley, 300 Md. 200 (1984). On October 14, 1985, the Circuit Court affirmed the Commission's grant of a Certificate to PEPCO for construction of the Brighton-High Ridge line. A subsequent appeal to the Court of Special Appeals of Maryland was withdrawn on November 26, 1985.

On February 4, 1988, the Brinkwood Community Association, Inc. (BCA), a party to the original proceeding, filed with the Commission a Request For Rehearing to Receive New Evidence (BCA Request). In its petition, the BCA alleges that

since the conclusion of hearings in this case [more than ten years ago], new facts have arisen "indicating a threat to the health and safety of Maryland citizens directly affected by the [Commission's] order." (BCA Request at 1.)

In response to the BCA Request, PEPCO asserted that there is no new evidence which would warrant modification of the Certificate. Nevertheless, PEPCO supported the BCA Request to reopen the proceeding, limited to the single issue of possible health effects associated with the operation of the Brighton-High Ridge transmission line.

By Order No. 67998, issued on February 29, 1988, the Commission reopened Case No. 7004:

> for the purpose of receiving and considering evidence . . . on the limited issue of the safety and health effects, if any, associated with the electromagnetic field resulting from the operation of the certificated [Brighton-High Ridge] line . . . . No other issue -- whether or not capable of having been raised during the prior hearings in Case No. 7004 -- except for the limited issue described above, shall be raised during the reopened proceeding. Re Potomac Electric Power Company, 79 Md. PSC 80, 82 (1988).

A prehearing conference in the reopened case was held on July 8, 1988. The following parties, who participated in the initial proceeding, entered their respective appearances: PEPCO, the Commission Staff (Staff), the Office of People's Counsel (OPC), the Department of Natural Resources (DNR), Howard County (HC), and Baltimore Gas and Electric Company

(BG&E). In addition, Maple Lawn Farms, Inc. (MLF) and 10 property owners appearing pro se were granted leave to intervene in the reopened case. The BCA chose not to retain counsel in this matter and, thus, did not intervene as a party. However, various property owners in the Brinkwood community were among those who were granted leave to intervene pro se.

Hearings on the limited issue specified by the Commission were held on March 27 through March 31, 1989. Initial Briefs were filed on April 26 with Reply Briefs on May 12, 1989.

PEPCO presented the testimony of eight expert witnesses. William F. Trapp, Manager of PEPCO's System Planning Department, prepared a loading profile for the Brighton-High Ridge line and the two double circuit 230 kV lines that will parallel the 500 kV line in Montgomery County. J. Michael Silva, a transmission line engineer and president of ENERTECH Consultants, testified regarding electric and magnetic fields in general, and of the Brighton-High Ridge line in particular.

PEPCO's next six witnesses reviewed the scientific literature on the question of possible health effects from exposure to electric and/or magnetic fields, then stated their opinions on the issue. Testifying in their personal capacity, the witnesses included: Edwin L. Carstensen, Professor of Engineering and Professor of Biophysics at the University of Rochester; Dr. H. Dwight Mercer, a veterinarian and comparative-toxicologist and Dean of the College of Veterinary Medicine of

Mississippi State University; Dr. Mark Israel, a pediatric oncologist and cancer researcher and Chief of the Molecular Genetics Section of the Pediatric Branch in the Division of Cancer Treatment at the National Cancer Institute (National Institutes of Health); Dr. Margaret A. Tucker, a physician and cancer epidemiologist, and Chief of the Family Studies Section of the Environmental Epidemiology Branch at the National Cancer Institute; Dr. Roswell K. Boutwell, an Emeritus Professor of Oncology at the University of Wisconsin, a cancer researcher at the McArdle Laboratory for Cancer Research, and a member of the National Cancer Advisory Board (which oversees the National Cancer Institute); and Dr. Richard Bockman, Associate Professor of Medicine and Associate Professor of Biochemistry at the Cornell University Medical College.

Testifying on behalf of DNR/Staff was Thomas E. Magette, Manager of Nuclear Programs for the Maryland Power Plant and Environmental Review (PPER) Division of DNR. In addition, Dr. J. Patrick Reilly, an electrical engineer with the Johns Hopkins University Applied Physics Laboratory and president of Metatec Company, testified as a consultant with Metatec regarding electric and magnetic fields in general and of the Brighton-High Ridge line in particular. Finally, Dr. William H. Bailey, a research scientist with Environmental Research Information, Inc. and a visiting research scientist at the Cornell University Medical College, prepared a report which discussed the scientific literature on the question herein.

The Office of People's Counsel sponsored the testimony of Dr. Charles Polk, Professor of Electrical Engineering at the University of Rhode Island and president of the Bioelectromagnetics Society. Dr. Polk, who testified in his individual capacity, discussed various laboratory and epidemiological studies which he believes are relevant to the issue in this case.

Howard County presented the testimony of Dr. Jerry L. Phillips, a biochemist at the Cancer Therapy and Research Foundation of South Texas and an Adjunct Professor of Medicine in the Division of Oncology at the University of Texas Health Science Center. Dr. Phillips, who testified in his personal capacity, discussed his own, as well as others' studies regarding possible biological effects from exposure to electric and/or magnetic fields.

In addition to the expert witnesses, several property owners and residents of the area through which the transmission line would traverse made statements for the record.

## I. BACKGROUND

Whenever electricity is generated, transmitted, or used, two types of fields -- electric and magnetic -- are produced. Speculation regarding possible adverse health effects from exposure to fields produced by electric facilities

intensified in the 1960's with reports from the Soviet Union on health problems experienced by workers in 400-500 kV switchyards. (DNR/Staff Ex. 5 at 19.) Initially, attention centered on exposure to electric fields as a possible source for various reported health effects. (See, for example, the Proposed Order of Hearing Examiner issued in this case at 71 Md. PSC 73, 94-97 (1980); and DNR/Staff Ex. 5 at 24.) More recently, scientists have focused upon possible effects from exposure to magnetic fields. (Born/Murch Ex. 1 at 15; DNR/Staff Ex. 3, Report at 1; DNR/Staff Ex. 5 at 24.) Unlike electric fields, it is very difficult to shield magnetic fields. (DNR/Staff Ex. 3, Report at 7.)

In discussing electric and magnetic fields in this proceeding, the unit of measurement utilized for electric fields was kilovolts (1 kilovolt = 1,000 volts) per meter (kV/m). The units of measurement for magnetic fields were Gauss (G) and milligauss (mG) where 1,000 mG equals 1 Gauss. The fields produced by most transmission lines oscillate between a maximum positive and negative value 60 times per second, otherwise referred to as a frequency of 60 Hertz (Hz). (DNR/Staff Ex. 3, Direct Testimony at 7-8.) Such fields are considered extremely low frequency (ELF) fields. (Id. at 8.)

The first 500 kV line constructed in the United States was built in 1964. (PEPCO Ex. 3 at 6.) At this time, there are approximately 25,000 circuit miles of 500 kV lines operating in this country, out of approximately 624,000 miles

of transmission and distribution lines rated at 22 kV and above. (Id.)

For purposes of discussion in this proceeding, the route of the Brighton-High Ridge transmission line was divided into three zones. In Zone 1, the line will parallel two existing double circuit 230 kV lines; the 250 foot right-of-way (ROW) designed for the 230 kV lines will be expanded to a 338 foot ROW to accommodate the addition of the 500 kV line. (PEPCO Ex. 3 at 10.)

Within a section of Zone 1 (for 1.1 miles through the Brinkwood community), the Certificate of Public Convenience and Necessity provides that the existing ROW remain at 250 feet; this will minimize the impact of the line upon the community. In order to accommodate both the new line and the two existing lines within the current ROW, different structural and conductor configurations for both the 230 kV lines and the 500 kV line were designed. (Id.) The section of the line through Brinkwood is referred to as Zone 2.

In Zone 3, the 500 kV line will diverge from the 230 kV lines -- continuing east to the vicinity of BG&E's High Ridge substation in Howard County. Along this portion of the route, steel poles in a delta configuration have been specified for the 500 kV line within a 150 foot ROW. (Id. at 11.)

## II. EVIDENCE PRESENTED

The sole issue in this case is whether the operation of PEPCO's certificated Brighton-High Ridge 500 kV transmission line will produce adverse health effects such that the Certificate of Public Convenience and Necessity, which was granted for construction and operation of the line, should be changed. In order to set the issue in context, evidence was introduced concerning electric transmission lines in general, and of the Brighton-High Ridge line in particular. In addition, evidence regarding known properties of electric fields and magnetic fields was presented. Thereafter, testimony was offered regarding both laboratory studies and epidemiological studies which have been conducted to investigate possible associations between electric and/or magnetic fields (such as those produced by transmission lines) and adverse health effects.

### A. Engineering Aspects of Electric Transmission Lines.

PEPCO witness Trapp presented a "loading profile" for both the Brighton-High Ridge line and the existing 230 kV lines which will parallel the 500 kV line in Montgomery County. The term "loading" refers to the amount of electric current carried by a transmission line. (PEPCO Ex. 1 at 1.) The range of loading conditions (categorized by amperes per circuit) for the 500 kV line and 230 kV lines included: emergency maximum,

heavy, normal, light, and emergency minimum. (Id. at 1-2; PEPCO Ex. 2.) According to Mr. Trapp, neither an emergency maximum nor a heavy loading condition has occurred on PEPCO's system. (PEPCO Ex. 1 at 2-3.)

Load growth on PEPCO's system will not affect the Brighton-High Ridge line since the line is designed primarily for transfers of bulk power among regions. (Tr. at 15.) Local loads will be supplied by PEPCO's underlying transmission and distribution system. (Id.) Because the primary function of the line is for power transfers, the loading conditions were described in terms of power imports and exports through interconnected power grids such as the Pennsylvania-New Jersey-Maryland (PJM) system. (PEPCO Ex. 1 at 2-4.)

PEPCO witness Silva calculated the electric and magnetic fields which will be produced by the Brighton-High Ridge line, as well as the existing 230 kV lines. The calculations were for fields at the edge of the ROW in each of the zones and under the five loading conditions identified by PEPCO witness Trapp. (PEPCO Exs. 10-15.)

As previously indicated, in Montgomery County the Brighton-High Ridge line is designed to parallel two double circuit 230 kV transmission lines. The electric fields and magnetic fields of these lines under normal loading conditions were calculated by Mr. Silva to be 0.29 kV/m and 18 mG at the south edge of the ROW and 0.21 kV/m and 27 mG at the north edge of the ROW. (PEPCO Exs. 11, 15.)

The electric and magnetic fields of the certificated 500 kV line (under normal loading conditions) at the south edge of the ROW were calculated by Mr. Silva to be 0.22 kV/m and 21 mG in Zone 1, and 0.37 kV/m and 27 mG in Zone 2. (PEPCO Exs. 10, 12, 13.) At the north edge of the ROW, the calculated electric and magnetic fields were 1.73 kV/m and 10 mG in Zone 1, and 1.34 kV/m and 13 mG in Zone 2. (Id.) In Zone 3, the calculated electric and magnetic fields were 1.78 kV/m and 8 mG at both the south and north edge of the ROW. (PEPCO Exs. 10, 14.)

Mr. Silva stated that a power line can experience "electrical imbalance" when the magnitude of the current in each phase of the line is unequal; it is a common condition in distribution lines and household wiring. (PEPCO Ex. 16 at 6.) According to this witness, electrical imbalance is insignificant on high voltage transmission lines because they are designed to avoid electrical imbalance. (Id. at 7.) For example, Mr. Silva noted that his calculated values for the electric and magnetic fields of the Brighton-High Ridge line might be off by one to two percent if there were small electrical imbalances on PEPCO's system. (Id.) His estimate of such a small variance was confirmed by subsequent measurements of other 500 kV lines on PEPCO's system which were "virtually identical" to the lines' calculated fields. (Id.)

"Ground current" was defined by Mr. Silva as a small part of electricity that travels through the ground, rather

than through electrical wires; it occurs when there is electrical imbalance. (Id.) According to the witness, for high voltage transmission lines, the effects of ground currents are small (less than one to two percent) because the lines are balanced. (Id. at 8.)

"Harmonics," in the context of power frequencies, were described by Mr. Silva as frequencies higher than 60 Hz that are associated with use of 60 Hz power; they are whole number multiples of 60 Hz, such as 120 Hz and 180 Hz. (Id.) While one might find harmonic frequencies from a 60 Hz high voltage transmission line, they would be at a very low level. (Id.)

Introduced into evidence through this witness was an exhibit, based upon calculations by Mr. Silva, indicating very large magnetic field exposures associated with normal use of some appliances, and some level of exposure associated with virtually any use of an appliance. (PEPCO Ex. 17.)

DNR/Staff witness Reilly calculated the magnetic fields for both the existing 230 kV lines and the certificated 500 kV line; the data used to calculate the fields was supplied by PEPCO as supplemented by responses to DNR data requests. (DNR/Staff Ex. 3, Direct Testimony at 11.) The magnetic fields of the existing 230 kV lines, operating under normal loading conditions, were calculated by Dr. Reilly to be 13.9 mG at the south edge of the ROW and 22.4 mG at the north edge of the ROW. (DNR/Staff Ex. 3, Table 3 Revised.) When the calculated fields

of the 500 kV line are added (using normal loading conditions), the magnetic fields at the south edge of the ROW were calculated by Dr. Reilly to be 18.9 mG in Zone 1, and 28.6 mG in Zone 2. (Id.) At the north edge of the ROW, with the addition of the 500 kV line, the calculated magnetic fields were 10.2 mG in Zone 1 and 14.1 mG in Zone 2. (Id.) In Zone 3, which would contain only the 500 kV line, the calculated magnetic fields were 9 mG at both the south and north edge of the ROW. (Id.)

Dr. Reilly explained that the magnetic fields produced by the 230 kV lines could be either increased or decreased at specific locations by the addition of the 500 kV line. (DNR/Staff Ex. 3, Direct Testimony at 13.) Among the factors which can affect the magnetic field levels are: line designs, current loads, and the interaction of the fields from each line. (Id.)

According to this witness, either electrical imbalance or higher current levels on a power line could cause the line's magnetic fields to be substantially greater than its calculated fields. (Id. at 15.) However, he also testified that "the effects of imbalance are greatest at distant locations where the field levels are already relatively small." (Id. at 17.)

B. The New York State Power Lines Project.

In addition to the expert witnesses who testified in this proceeding, a document prepared for the New York Public Service Commission entitled Biological Effects of Power Line Fields was received into evidence[1] at the request of Intervenors Born and Murch, and designated as Born/Murch Exhibit 1. The document (hereinafter sometimes referred to as Panel Report) was written by the Scientific Advisory Panel of the New York State Power Lines Project (NYSPLP) and submitted to the New York Commission on July 1, 1987.

The NYSPLP was initiated by the New York Public Service Commission "to conduct research and to review the scientific literature to determine whether health hazards of [electric and magnetic] fields are possible." (Born/Murch Ex. 1 at 1.) The New York Department of Health administered the five-year project, while the responsibility of developing the research program and overseeing the original sixteen (and two extension) research projects was given to a Scientific Advisory Panel of scientists and engineers. (Id. at 2.) The $5 million project was funded by the New York Power Authority and New York's seven major electric utilities. (Id. at 12 and 18.)

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[1] See, Hearing Examiner's Ruling on Evidentiary Matters, March 20, 1989, Case No. 7004.

The Panel Report extensively reviewed the research projects funded by the NYSPLP[2] as well as previous studies reported in the scientific literature on the issue of possible biological effects from exposure to electric and/or magnetic fields. The projects funded by the NYSPLP were in seven general subject areas: genetic, cytogenetic, teratogenic and reproductive studies; cell biology studies; proliferation of cancer cells in culture; neurobiology; behavior; multidisciplinary studies of human exposure; and epidemiology of cancer incidence. (Id. 3-9.) The electric and magnetic fields utilized in the NYSPLP laboratory studies were in the range of 1 to 50 kV/m and 0.1 to 10 Gauss; such levels are typical of those found under 765 kV lines -- the size of particular interest to the New York Commission. (Id. at 2.)

In the Report's section entitled Recommendations, the Panel states, "[r]esearch sponsored by this project and related research has demonstrated variety [sic] of effects of electrical and magnetic fields. These findings do not readily translate into concrete regulatory recommendations on width of right-of-way, line heights, or location of lines near homes." (Id. at 134.) However, the Panel did recommend further research in specific areas, administered "by an agency, prefer-

[2] The details of each project are contained in separately published Appendices to the Panel Report. Only the Panel Report was offered, and received, into evidence.

ably federal, which is credible by virtue of being clearly independent of partisan influence." (Id. at 135.)

Several of the NYSPLP funded projects were cited and/or critiqued by the expert witnesses in this proceeding. The witnesses' comments regarding those NYSPLP studies will be discussed infra.

C. Scientific Studies.

The remaining expert witnesses who testified in this matter analyzed numerous scientific studies which have investigated possible health effects from exposure to electric and/or magnetic fields. In this section of the Proposed Order, a brief summation of each witness' testimony will be given; the following subsections contain a review of several studies which were discussed in depth and relied upon by the witnesses in forming their opinions on the issue in this case.

The scientific studies were classified as either epidemiological, laboratory, or field studies. Epidemiological studies were defined as those which "assess possible relationships between various exposures and risk of specific diseases." (PEPCO Ex. 24 at 7.) Laboratory studies were further classified as either in vitro or in vivo. In vitro studies investigate the effects of an agent upon individual tissues, cells, or molecules in test tubes or in petri dishes; in vivo studies investigate the effects of an agent upon intact, living

organisms. Field studies observe/examine animals in a "real-world" environment.

PEPCO witness Carstensen testified that in his 1987 book entitled Biological Effects of Transmission Line Fields, he analyzed more than 500 original studies on the biological effects of electric and magnetic fields. (PEPCO Ex. 19 at 3.) The studies investigated, among other things, the effects of such fields on the nervous, immune and hematologic systems, as well as changes in anatomy, body chemistry, and behavior. (Id. at 4.)

Dr. Carstensen identified several confirmed biological effects associated with electric fields; for example: vibration of body hair (at electric field strengths of 5 kV/m and higher), leaf-tip corona (damage to leaves), and electric shocks (at electric field strengths of 8-10 kV/m). (Id. at 5.) None of these effects would occur beyond the right-of-way of the Brighton-High Ridge line. (Id. at 8.) According to Dr. Carstensen, studies have not "confirmed" any biological effects associated with exposure to magnetic fields from high voltage transmission lines. (Id. at 6.)

PEPCO witness Mercer's testimony was mainly concerned with whole animal studies, which take into account the many natural variables and defense mechanisms in the living body. Such studies, in his view, are more important than in vitro studies in extrapolating observed effects to humans. (PEPCO Ex. 20 at 6.) According to Dr. Mercer, there are "a multitude

of reported 'effects' at the in vitro level which are not seen in the intact animal [and, thus,] have no implication in terms of adverse health effects." (PEPCO Ex. 21 at 3.) Based upon his review of the reported studies of whole animals, as well as his experience as a comparative toxicologist, Dr. Mercer does not believe that exposure to the electric/magnetic fields of the Brighton-High Ridge transmission line will result in any adverse human health effects. (PEPCO Ex. 20 at 14.)

PEPCO witness Israel reviewed studies which have investigated whether exposure to electric and/or magnetic fields "results in cellular or genetic alterations or damage that could lead to cancer." (PEPCO Ex. 22 at 5.) Also considered were studies which looked at whether exposure to such fields enhances the malignant behavior of tumor cells. (Id.) In the opinion of Dr. Israel, there is no scientific basis to believe that exposure to electric/magnetic fields (including those from the certificated Brighton-High Ridge line) would cause or promote cancer. (Id. at 8.)

PEPCO witness Tucker reviewed the epidemiology studies which have looked for an association between exposure to electric/magnetic fields and a possible risk of cancer. (PEPCO Ex. 24 at 6.) After discussing the importance of determining exposures in epidemiological studies, Dr. Tucker stated that the "accuracy of an association between a disease and an exposure is only as good as the measure of exposure." (Id. at 7.) If actual measurements are not available, epidemiol-

ogists attempt to reconstruct what the probable exposure was through questionnaires, occupational records, medical records, etc. (Id. at 8.) Dr. Tucker explained the role of confounders, which can obscure a relationship or lack of relationship between a particular exposure and other risks. (Id. at 10.) She further testified that results from multiple studies are necessary before one can conclude that a particular agent did or did not have an effect on people. (Id. at 11.) Also important to epidemiologists is consistency within studies and between studies, as well as a consistent pattern of increasing risk with increasing exposure (that is, a dose/response relationship). (Id. at 11-12.)

After reviewing both occupational and residential epidemiological studies which have looked for an association between electric and/or magnetic fields and cancer, Dr. Tucker concluded that there is "no persuasive scientific evidence of an increased risk of cancer . . . from exposure to power frequency electric and/or magnetic fields." (Id. at 17.)

PEPCO witness Boutwell examined "the scientific studies on exposure to electric and magnetic fields as it relates to carcinogenisis, including the initiation and promotion of cancer." (PEPCO Ex. 27 at 4.) Dr. Boutwell testified that because power frequency fields are not capable of directly breaking a chemical bond in the genetic material of the cell, such fields cannot be cancer initiators. (Id. at 5.) After commenting upon various studies, Dr. Boutwell concluded that

there is "no scientific basis for the assertion that power frequency electric and/or magnetic fields act to cause cancer initiation, cancer promotion, or cancer progression." (Id. at 10.)

PEPCO witness Bockman, who conducts scientific research in both immunology and endocrinology, examined the scientific studies in those two disciplines as they relate to power frequency electric and magnetic fields. (PEPCO Ex. 28 at 3.) After critiquing various studies, Dr. Bockman stated that power frequency electric and/or magnetic fields do not have an adverse effect on the endocrine or immune systems. (Id. at 10.)

OPC witness Polk reviewed several epidemiological studies which suggest an association between exposure to electric/magnetic fields and adverse health effects. He also discussed certain laboratory studies which he believes show possible mechanisms of interaction between electric/magnetic fields and effects on biological systems which could explain the reported epidemiological findings. Specifically cited as possible mechanisms of interaction were: polarization effects, magnetic resonance effects, or changes in charge distributions. (OPC Ex. 5 at 7.)

"Window effects" were described by Dr. Polk as effects which appear only within particular frequency and amplitude "windows." (OPC Ex. 4 at 7.) Thus, a lack of an effect

at certain frequencies and amplitudes does not mean that effects at other frequencies and amplitudes would not be seen.

While stating that more research is needed, Dr. Polk suggested that PEPCO attempt to reduce the magnetic fields at the edge of the right-of-way of the Brighton-High Ridge line to the lowest possible level, within a "reasonable" cost. (Tr. at 335.) He later suggested that "it would be reasonable to try to get [magnetic field] levels at the edge of the right-of-way below 10 mG." (Tr. at 342.) Dr. Polk testified that recent technology indicates that new transmission lines can be built which substantially reduce magnetic fields at the edge of transmission line rights-of-way. (OPC Ex. 4 at 18.)

Given the epidemiological reports of a possible association between electric/magnetic fields and cancer, and the in vitro experiments which he believes suggests a mechanism of interaction between the two, Dr. Polk urges that exposure to such fields be minimized as much as possible. (Tr. at 241-243.)

DNR/Staff witness Bailey submitted a report providing an overview of the scientific literature on the issue in this case. (DNR/Staff Ex. 5.) In his report, Dr. Bailey described the "Weight of the Evidence" system developed by the federal Environmental Protection Agency (EPA) as providing a framework to evaluate human and animal data from which decisions by scientists and governmental agencies can be made. (DNR/Staff Ex. 5 at 16.) For example, according to Dr. Bailey the EPA Guidelines for Carcinogen Risk Assessment indicate that:

> epidemiologic and laboratory studies will have associated with them varying degrees of reliability and uncertainty . . . [depending] on the number and completeness of relevant studies available for consideration, on the thoroughness of the studies, and on the care with which confounding or extraneous variables were identified and accounted for. (Id.)

With respect to those epidemiological studies which have reported an association between electric/magnetic fields and adverse health effects, Dr. Bailey believes the studies: lack consistency, fail to show dose-response relationships, report associations which are weak, fail to identify possible biases, fail to control for potential confounding factors, and lack an exposure assessment. (Id. at 32-33.)

With respect to those laboratory studies which have indicated a potential for adverse health effects from exposure to electric/magnetic fields, Dr. Bailey testified that: they have failed to be replicated, some effects also occur under normal physiologic conditions (and, thus, are only indirectly suggestive of a harmful effect), some responses are inconsistent and contradictory, and some have failed to detect any deleterious effects. (Id. at 40 and 45.)

Dr. Bailey also discussed the findings of four separate panels that have independently reviewed the question of possible health effects from electric/magnetic fields. The panels were sponsored, respectively, by the National Academy of Sciences and American Institute of Biological Sciences (1985)

(Id. at 49); the Florida Electric and Magnetic Fields Science Advisory Commission (1985) (Id. at 51); the World Health Organization (1984 & 1987) (Id. at 52); and the New York Public Service Commission (1987) (Id. at 54) [discussed supra]. According to Dr. Bailey, "[i]n no case did the panels conclude that the electric or magnetic fields posed public health risks." (Id. at 49.)

Based upon the weight of the scientific evidence to date, it is Dr. Bailey's opinion that the operation of the Brighton-High Ridge line would not adversely affect human health and safety. (DNR/Staff Ex. 4 at 8.)

Howard County witness Phillips reviewed the current literature on the issue of exposure to electric and/or magnetic fields and possible health risks, and discussed his own research in this area. (HC Ex. 1 at 8.) In his opinion, "it is probable that the observed changes in biological structure and function are related to adverse effects on human health and development." (Id. at 19.) As a result, Dr. Phillips believes that "it is imperative to minimize exposure of the general public as much as possible." (Id. at 20.)

1. Laboratory Studies.

A study by Bawin and Adey (1976) showed a reduction in the efflux of previously absorbed calcium from chick brain tissue when subjected to a 16 Hz electric field for a period of

20 minutes. (OPC Ex. 4 at 7; Born/Murch Ex. 1 at 107.) Subsequent studies by Blackman (1982) (1985), which exposed tissue to a combined electric and magnetic field, showed an increase in calcium efflux. (OPC Ex. 4 at 8; Born/Murch Ex. 1 at 107.)

The Bawin and Adey study is considered important by OPC witness Polk because: "calcium currents profoundly influence the functioning of nerve cells . . . [,] because of the extremely low intensity of the electric field at the tissue level . . . and because it was the first report of a 'window effect.'" (OPC Ex. 4 at 7.) Similarly, Howard County witness Phillips finds the studies important "since calcium is a major regulator of cellular events." (HC Ex. 1 at 17.) Although the Bawin and Adey study showed a decrease in calcium efflux and the Blackman study showed an increase, Dr. Phillips considers them a confirmation of one another because they both "demonstrate a change in the movement of calcium across cellular membranes." (HC Ex. 2 at 10.) Dr. Phillips suggested an explanation for the contradiction between the results of the two studies: the Bawin and Adey study used an oscillating alternating current (AC) electric field while Blackman used an AC electromagnetic field. (Id. at 9.) Another possible factor cited was the local geomagnetic field. (Id.; OPC Ex. 4 at 8.)

PEPCO witness Bockman testified that a study of calcium efflux has "limited value, since many of the important functions of calcium metabolism occur inside the cell and cannot be evaluated by calcium release." (PEPCO Ex. 28 at 8.)

With respect to the two studies reaching opposite results, Dr. Bockman stated that "it is probable that any reported effects were not caused by the experimental condition . . ." (Id. at 9.) According to Dr. Bockman, attempts to replicate this research have produced results that were contradictory, while others found no change at all in calcium efflux. (Id.) He also stated that, "the variability in the measurements [in the two studies] is high, and that this alone could account for the statistical differences measured." (Id. at 10.) Finally, Dr. Bockman testified that "even taking the Bawin & Adey and Blackman research at face value, no adverse health effects are suggested by those results." (Id.)

DNR/Staff witness Bailey noted that the "results obtained by Albert et al. (1987) are at variance with both Bawin and Adey (1976) and Blackman et al (1985) since [Albert] observed no changes in Ca++ handling by the tissues." (Emphasis in original.) (DNR/Staff Ex. 5 at 22.) Dr. Bailey also stated that, "[i]t is generally recognized (e.g. Myers and Ross, 1981) that these types of experiments are technically very demanding and subject to numerous sources of experimental artifacts." (Id.) Acknowledging the hypothesis cited by Dr. Polk and Dr. Phillips to explain the Bawin and Adey and Blackman studies' opposite results, Dr. Bailey testified that the "inconsistencies and contradictions remain" so that he had "little confidence in the reliability of these results." (DNR/Staff Ex. 6 at 14.)

Various studies concerning possible effects of electric/magnetic fields upon "circadian rhythms"[3] were also discussed. Howard County witness Phillips testified that electromagnetic field exposure has "been shown to cause a marked reduction in night time levels of a brain hormone known as melatonin produced by the pineal gland." (HC Ex. 1 at 13.) According to Dr. Phillips, such reductions in melatonin may be related to, among other things, changes in circadian rhythms. (Id. at 13-14.) He cited a study by Groah and colleagues which "demonstrated that the electric field exposure of mice causes phase changes in circadian rhythms." (HC Ex. 2 at 35.) He further stated that at a recent Department of Energy/Electric Power Research Institute Contractor's Meeting, those researchers stated that the "'consequences of their [circadian rhythms] disruption can lead to suboptimal performance in biochemical, physiological and phsychiological [sic] processes.'" (Id.)

The NYSPLP sponsored studies by Sulzman and Murrish regarding the effects of exposure to electric/magnetic fields on biological rhythms. (Born/Murch Ex. 1 at 110.) The Panel noted that "[d]ysfunctions in circadian rhythms are important because they can profoundly affect psychological and biochemical processes." (Id. at 108.)

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[3] Circadian rhythms were defined by DNR/Staff witness Bailey as "patterns of physiological activity that fluctuate as a function of the time of day." (DNR/Staff Ex. 5 at 44.)

In the Sulzman study, a magnetic field of 1 Gauss was utilized with three different levels of electric field intensity: 2.6 kV/m, 26 kV/m, and 39 kV/m. (Id. at 111.) (For the purposes of comparison, the electric fields of the Brighton-High Ridge line will be within the range of 0.22 kV/m and 1.78 kV/m while the magnetic fields will be within the range of 8 mG to 27 mG [see page 11 supra].) According to the Panel Report, the results of the Sulzman study,

> showed an intensity-dependent effect. None of the monkeys exposed to the 2.6 kV/m fields demonstrated any change in the free-running periods of lever pressing (feeding) or oxygen consumption. On the other hand, 33% of the monkeys exposed to the 26 kV/m fields and 75% of the monkeys exposed to the 39 kV/m electric fields showed a significant lengthening of period. (Id.)

The investigators "also reported apparent chronic or long-term effects from exposures to the higher intensity electric fields." (Id.)

While noting that the NYSPLP did not investigate the effects of 60 Hz electromagnetic fields on melatonin synthesis per se (Id. at 112), the Panel stated that the various studies

> suggest that long-term exposure to electromagnetic fields can shift or induce a lag in intrinsic rhythms. These shifts may be chronic once they appear. On the other hand, power-frequency electromagnetic fields tend to affect melatonin synthesis within minutes; however, the effect is transient and reversible within a few hours to days. (Id. at 113.)

DNR/Staff witness Bailey also discussed studies on melatonin; the studies were conducted by Wilson et al. and published in 1981, 1983, and 1986. (DNR/Staff Ex. 5 at 44.) According to Dr. Bailey, the studies showed that rats continuously exposed to electric fields ranging from 1.9 kV/m to 40 kV/m experienced reduced secretion of melatonin during the night. (Id.) He also noted, however, that the "response is not unique to electric field exposure because the presence of even weak illumination of the rats' cages during the night also produces a similar reduction in melatonin secretion." (Id.) Moreover, Dr. Bailey observed that the melatonin level returns to normal within a few days after exposure. (Id.) He also testified that "it is not at all clear that changes in the melatonin within the normal range are adverse." (Tr. at 470.)

PEPCO witness Bockman commented upon the Groah study cited by Dr. Phillips, observing that the electric field exposed mice were in a highly artificial laboratory setting and deprived of most environmental cues. (PEPCO Ex. 28 at 6.) He also stated that there was "no information as to whether free-living rodents experience this nighttime rise [in melatonin]." (Id.) Dr. Bockman observed that other common stimuli, such as artificial light or watching TV after dark "will cause changes in the level of melatonin." (Id.) Dr. Bockman further testified that as an endocrinologist and a medical doctor, he is not concerned about changes in melatonin in reported studies, nor similar changes caused by everyday stimuli. (Id. at 6.)

Possible effects from exposure to electric and/or magnetic fields on the brain chemical 5-hydroxyindoleacetic acid (5-HIAA) were also discussed by several witnesses.

Howard County witness Phillips testified that laboratory animals exposed to electromagnetic fields experienced a chronic decrease in 5-HIAA. (HC Ex. 1 at 15.) He noted that "in studies not related to the electromagnetic field literature, decreased . . . levels of 5-HIAA have been associated with poor impulse control in humans which may manifest itself either as aggression towards others or . . . as attempts at suicide." (Id.)

A study by Wolpaw, funded by the NYSPLP, noted a significant decrease in 5-HIAA of macaque monkeys exposed to 60 Hz electric and magnetic fields. (Born/Murch Ex. 1 at 115.) The specific endpoints investigated by Wolpaw included effects on the monkeys' behavior, performance, general health, neurophysiology, and neurochemistry. (DNR/Staff Ex. 6 at 36.) The monkeys were exposed to electric and magnetic fields of either 3 kV/m and 0.1 Gauss, or 30 kV/m and 0.9 Gauss for a period of 21 days. (Born/Murch Ex. 1 at 111.) According to the NYSPLP Panel Report, "[i]n the Wolpaw studies, a great many measures of well-being of the macaques were recorded, including weight, blood-cell counts, blood chemistries and tests of motor skill, and no significant effects of the fields were encountered." (Id. at 114.) While recognizing a significant decrease in 5-HIAA, the Panel states that the "studies leave unresolved the

important question if the effects of fields on biologic amine metabolism correspond to abnormalities in learning or other behavior." (Id. at 115.)

DNR/Staff witness Bailey discussed, in general, experiments concerning 5-HIAA. (DNR/Staff Ex. 6 at 34-36.) Dr. Bailey noted that 5-HIAA is actually a waste product of the neurotransmitter serotonin. (Id. at 34.) "Neurotransmitters . . . are chemical messengers used by nerve cells to communicate with other nerve cells." (Id. at 34-35.) The importance of 5-HIAA is that it can serve as an indirect index of neurotransmitter function. (Id. at 35.) However, Dr. Bailey noted that a change in the level of a neurotransmitter waste product "does not always reflect corresponding changes in the level of the neurotransmitter itself, or the rate at which it is synthesized and released. All these are the variables that are functionally important." (Id. at 36.)

In discussing the Wolpaw study, Dr. Bailey testified that although a decrease in 5-HIAA was noticed by the authors, "this neurochemical finding did not alter the monkeys' behavior and no evidence of distress was found." (Id.) The witness also found Dr. Phillips' statements implying a possible association between decreased 5-HIAA levels in cerebrospinal fluid and aggression and/or suicide to be "unwarranted speculation." (Id. at 37.) According to Dr. Bailey, a study by Gjerris et al. (1987) showed "no relationship between levels of 5-HIAA in

the cerebrospinal fluid and depression, the later [sic] being a major risk factor for suicide." (Id. at 38.)

PEPCO witness Bockman also discussed research on the substance 5-HIAA, stating that results have been inconsistent. (PEPCO Ex. 28 at 6.) In different experiments, when laboratory animals were exposed to power frequency fields, some researchers found a decrease in the level of 5-HIAA, some found an increase, while others have found no effect. (Id.) According to Dr. Bockman, "[t]his lack of consistency in the study results makes it highly unlikely that changes in 5-HIAA levels are related to exposure to power frequency fields." (Id. at 7.)

A study by Salzinger (funded by the NYSPLP) evaluated the effects of preperinatal (one day after conception to 8 days after birth) 60 Hz field exposure upon learning and behavior in adult rats. (Born/Murch Ex. 1 at 121.) There were two exposure levels for the electric and magnetic fields: 30 kV/m and 1 Gauss; or 10 kV/m and 0.33 Gauss. (Id.) The NYSPLP Panel Report states that,

> power-line-intensity electromagnetic fields do not appear to influence even the most complex operant schedules during adult learning situations. However, interactions between background field conditions and the 60-Hz magnetic component can influence behavior. The effect is transient and reversible. On the other hand, prenatal exposure to these fields produces more or less permanent changes in response activity. The meaning of the effect is obscure and its onset requires a long history of testing. (Id. at 123.)

Dr. Phillips cited the Salzinger study as indicating "significant changes in the behavior of [laboratory] animals . . . after the animals had reached adulthood." (HC Ex. 1 at 14.) The study is important to Dr. Phillips, "because it stresses the latency that exists before some electromagnetic field induced changes become apparent." (Id.)

DNR/Staff witness Bailey also discussed the Salzinger report. According to Dr. Bailey, initially the performance of the exposed rats was similar to the controls. Over time, however, the exposed rats' performance "was enhanced relative to the controls. It was enhanced or more efficient because they received the same number of food pellets as control rats with less effort (fewer bar presses)." (DNR/Staff Ex. 6 at 31.) Dr. Bailey also observed, however, that the way in which Salzinger "food-deprived the animals to motivate their performance is known not to produce a stable rate of bar pressing as testing continues -- it leads to increases in the rate of bar pressing as the number of testing sessions increases." (Id. at 32.) In his opinion, there is a good possibility that had Salzinger used a different food-deprivation schedule to motivate the rats, he would not have obtained the results which he did. (Id.)

The "Henhouse Study," a group of studies performed in six different laboratories in Europe, Canada, and the United States, subjected incubating chicken eggs to pulsed-magnetic fields. Two of the six laboratories reported increased numbers

of abnormal embryos. (OPC Ex. 4 at 5; Tr. at 620; PEPCO Ex. 21 at 5.) The Henhouse Project was considered a replication of an earlier study by Delgado. (Tr. at 620; DNR/Staff Ex. 6 at 2.)

In the view of Dr. Polk and Dr. Phillips, exposure of the embryos to magnetic fields caused the embryo abnormalities. (OPC Ex. 4 at 6; Tr. at 621.) Although, according to Dr. Polk, the experiments in the Henhouse Project were conducted under "identical setups," he noted two variables which were different among the six laboratories: (1) the earth's magnetic direct current (DC) field varies from locale to locale; and (2) the use of local power supplies for energizing the heaters in the incubators (50 Hz in Europe and 60 Hz in the U.S. and Canada). (Tr. at 235-237.) He believes these variables could explain the disparate results from the different labs. (Id.)

The Henhouse Project was critiqued by PEPCO witness Mercer who noted that the six laboratories: used a pulsed magnetic field (unlike fields produced by power lines), utilized a small number of chicken eggs, and obtained the eggs from different sources. (PEPCO Ex. 21 at 5; Tr. at 164.) In contrast to the Henhouse Project, Dr. Mercer cited two studies by Graves (1978) (1984) which exposed chick embryos to power frequency fields. According to Dr. Mercer, Graves' 1978 study found "no significant effects on the growth, development, or mortality of the chicks." (PEPCO Ex. 21 at 5.) The 1984 study "revealed no effect of power frequency electric fields on processes associated with the growth, development, or the overall health and

well-being of avian embryos." (Id.) Dr. Mercer also noted that the Graves studies were important in that they followed the birds through to broiler production size, with no indication of ill effects. (Tr. at 151-152.)

With respect to his own interest in this area of inquiry, Dr. Mercer noted that,

> we monitor every hatchery in the State of Mississippi every month. We know not only how many eggs they hatch and what the abnormal embryo status of those eggs are, we know what causes them to have those problems. So, yes, I have a very distinct interest in whether or not electromagnetic fields affect chicken embryos. (Tr. at 154.)

Dr. Mercer acknowledged that there are studies which indicate a possible effect upon chick embryos from exposure to electromagnetic fields -- such as the Juutilainen studies cited by Dr. Polk and Dr. Phillips. He stated, however, that if the results of such a study are accurate, then similar results (abnormalities) should be showing up throughout the broiler industry, "[a]nd I don't see that happening." (Tr. at 154-155.)

DNR/Staff witness Bailey cited three reasons for believing the Henhouse Project is irrelevant to the question of possible health effects from exposure to electric/magnetic fields associated with power transmission lines. (DNR/Staff Ex. 6 at 5-6.) First, the waveform, frequency, and amplitude of the fields used in the Project were unlike those produced by 60 Hz power transmission lines. Second, the conclusion that

the effects observed were directly attributable to electric and/or magnetic field exposure is highly uncertain. And third,

> both internal and external factors affecting chick embryo development are known to be different from those affecting the development of human embryos. Species differences between avian and mammalian species, particularly in regard to reproductive processes are well-known and effects observed in chick embryos do not predict effects in humans (Wilson, 1978 [footnote omitted]). (Id. at 6.)

Dr. Bailey also observed that the results from the six laboratories may have varied because: the eggs utilized were not obtained from the same source (Tr. at 452) and the temperature of the eggs may have differed (Tr. at 454-455). To Dr. Bailey, "[t]his lack of reproducibility suggests that the fields themselves may have no effect and that the occasional differences that are reported depend upon other factors." (DNR/Staff Ex. 6 at 4.) In this regard, he cited a study by Leal et al. (1987) which "contains data that suggest if an influence of a 100-Hz pulsed magnetic field exists, the magnitude of the effect is less than that ascribed by the investigators to the effect produced by naturally-occurring very minute fluctuations in the earth's DC magnetic field . . . ." (Id.)

Although the NYSPLP Panel Report was issued prior to the Henhouse Project, the Panel did discuss the Delgado et al. (1982) study, which the Henhouse Project was supposed to replicate. Specifically, the Panel stated that "[e]ven if Delgado's results are replicated, extrapolation cannot be made

from these studies to human fetuses, because developmental control is so different in these species. Experimental effects on chick embryos have not been found to be predictive of any human fetal effects of the same agent (Wilson, 1978)." (Born/Murch Ex. 1 at 61-62.)

Dr. Phillips also briefly cited two studies with respect to the effects of electric/magnetic fields on the nervous system: one by Pardasano et al. (1986) and one by Hansson (1981). (HC Ex. 2 at 33-34.) Dr. Phillips testified that the former study (which exposed chicken embryos to a 60 Hz magnetic field of 800 mG) "demonstrated an effect of magnetic field exposure on the cytoskeleton." (Id. at 33.) The latter study reported "changes and even damage to the nervous system" of newborn rabbits, rats, and mice from long-term exposure to 50 or 60 Hz electric fields. (Id. at 33-34.) It also showed "an effect of electric field exposure on the cytoskeleton system central nervous system cells." (Id. at 34.)

The NYSPLP Panel Report also discusses the Hansson (1981) study, noting that the author "reported stunting of growth of wild rabbits reared outdoors in a 50-Hz field, but did not find effects when the same rabbits were exposed in a laboratory setting." (Born/Murch Ex. 1 at 59.) The Panel Report observed that the:

> outdoor exposure of these rabbits also raises serious questions regarding effects of uncontrolled temperature, humidity, etc. There is almost no quantification of results or, indeed, of the total number of

animals or electron micrographs examined. The claim that "marked neuronal alterations were observed in several (other) parts of the brain and retina" was made without presentation of any evidence. (Id. at 99.)

According to the Panel Report, subsequent studies by Albert, et al. (1984) (1985a) and Gona (funded by the NYSPLP) were unable to confirm Hansson's results. (Id. at 99-102.)

A study by Carsten and Benz (1987) was funded by the NYSPLP "to investigate effects of exposure [from electric and magnetic fields] on fetal development and fertility . . . ." (Born/Murch Ex. 1 at 56.) The study exposed two strains of mice over three generations to combined electric and magnetic fields at two different intensities: 50 kV/m and 10,000 mG; and 15 kV/m and 3,000 mG. (DNR/Staff Ex. 5 at 47.) According to DNR/Staff witness Bailey, "[n]o adverse effects of these exposures on reproduction, development, or the integrity of chromosomes were observed." (Id.)

In discussing the Carsten and Benz study, the NYSPLP Panel observed that "because no effects were found, further testing of mice is not indicated for these same endpoints." (Born/Murch Ex. 1 at 57.) The Panel noted that although "[e]xtrapolation of risks from results of animal studies to humans is tenuous given the complexities of human exposures . . . the fact that no damage has been detected . . . is reassuring even if this does not constitute definitive proof that humans are similarly not vulnerable to these fields." (Id.)

PEPCO witness Israel also discussed the Carsten and Benz study. According to Dr. Israel, no genetic effects on chromosomes in blood cells (which could lead to the development of cancer) were found. (PEPCO Ex. 22 at 5.) In addition, Dr. Israel cited separate studies by Cohen and by Livingston (both part of the NYSPLP) which found that genetic material in human lymphocytes was not affected by exposure to electric and/or magnetic fields. (Id. at 6.)

Other genetic studies cited by Dr. Israel included one by Reese (1988) and one by Thomson. (Id. at 6-7.) In the former, Reese exposed ovary cells to 60 Hz electric fields, magnetic fields, and combined electric/magnetic fields; Dr. Israel stated that, "Reese found no differences in DNA damage between the exposed and unexposed cells." (Id. at 7.) In the latter study, Thomson "measured the effects of 60 Hz magnetic field exposure on tumor growth and survival of mice implanted with a transplantable leukemia cell. They detected no differences in tumor incidence or animal survival." (Id.)

PEPCO witness Boutwell observed that the Carsten and Benz study was important for several reasons: a very large number of experimental animals (over 2,000 mice) were used; it was a multi-generational study; and it was an in vivo study. (PEPCO Ex. 27 at 9.) The study was cited by Dr. Boutwell for the proposition that power fields do not act as cancer initiators or promoters. (Id. at 9-10.) According to the witness, if electric and/or magnetic fields were carcinogens, "we would

have expected to see tumors, reduced litter sizes, and other adverse effects, including high levels of mortality. In fact, none of these effects were seen." (Id. at 10.)

PEPCO witness Mercer, too, cited the Carsten and Benz study (among others) as one which found no effects from electric/magnetic fields upon reproduction, growth and development, behavior, and stress in rats. (PEPCO Ex. 20 at 9.) Dr. Mercer also discussed studies by Seto et al.; Sikov; Fam; and Phillips, R.D., et al. According to Dr. Mercer, Seto found no effects on fertility or birth outcome; Sikov found no adverse effects; Fam detected no effects on fertility, growth, or development; and Phillips, with the exception of some fetal malformations, found no adverse effects. (Id. at 7-8.) Dr. Mercer identified four factors which may have caused the fetal malformations in the Phillips study: first, there was a severe disease outbreak among the animals under study; second, the sick animals were treated with drugs; third, in the first generation, there were more teratogenic (abnormal) effects in the nonexposed animals than the exposed animals; and fourth, the animal under study -- the Hanford swine, is a highly inbred and sensitive animal such that it is the wrong animal model to study possible teratogenic effects. (Id. at 8-9.)

Dr. Mercer also discussed studies which have evaluated whether animals are stressed by exposure to electric and/or magnetic fields. First, a study by Amstutz and Miller which exposed a variety of animals to fields from a 765 kV line

found no effect on grow-out rates, feed conversion, or other performance characteristics. (Id. at 11-12.) Next, a study by Alger and Hennicks, which considered the effects on dairy cattle from a 400 kV transmission line, found no differences between exposed and non-exposed animals. (Id. at 12.)

Studies by Goodman and Henderson (1986) (1988) investigated the effect of magnetic field exposure (both pulsed and sinusoidal) on "cellular transcription" in the salivary glands of fruit flies. (OPC Ex. 4 at 9.) OPC witness Polk defined cellular transcription as "the process of transferring [basic hereditary] information from DNA to the RNA molecular chain." (Id.) According to Dr. Polk, the authors of the Goodman studies claim that pulsed as well as sinusoidal magnetic fields "'can cause measurable changes in protein synthesis.'" (Id.)

Howard County witness Phillips also cited the Goodman and Henderson studies as relevant to the issue in this case. According to this witness, the studies "indicated an effect of magnetic field exposure on the expression of the cell's genetic information . . . . [A]ltering the expression of the cell's genetic information may alter, in a significant way, the properties of the cell." (HC Ex. 1 at 13.) Dr. Phillips notes, for example, that changes in gene expression are crucial to the promotion and progression stages in the development of malignant cells. (Tr. 625-626.) Dr. Phillips testified that the Goodman and Henderson experiments show that the gene expression

or transcription of cells exposed to magnetic fields is different "compared to the controlled cells." (Tr. 624.) He later testified, however, that while the gene expression of exposed cells "is abnormal, [it is] not necessarily related to malignancy." (Tr. at 627.) "[W]e have defined one more area of science that may indicate a relationship to malignancy, maybe not." (Id.)

With respect to the Goodman and Henderson studies, DNR/Staff witness Bailey testified that, "changes in gene expression are . . . observed in normal cells daily throughout the lives of organisms." (DNR/Staff Ex. 6 at 26.) In addition, Dr. Bailey disagreed with the implication that the changes in gene expression or protein synthesis in the salivary glands of fruit flies can be immediately extrapolated from in vitro experiments to an in vivo situation, let alone to humans. (Id. at 26-27.)

PEPCO witness Israel testified in a similar vein that "virtually anything you do to a cell . . . will lead to a change in transcription." (Tr. at 210.) He also agreed with the statement that a "change in transcription is not in and of itself an adverse change." (Tr. at 211.) Dr. Israel further stated that the "apparent 'effects' reported in the Goodman study have never been shown to have any association with cancer." (PEPCO Ex. 23 at 12.)

A study by Byus, Pieper and Adey (1987) showed that cells exposed to 60 Hz electric fields experienced a signifi-

cant but temporary increase in ornithine decarboxylase (ODC) activity as measured within an hour or two after exposure ceased. (OPC Ex. 4 at 11; HC Ex. 2 at 28-31; DNR/Staff Ex. 5 at 38.)

The importance of these experiments to OPC witness Polk "is that an increase of ODC activity, while not necessarily a sign of cancer, is characteristic of all rapidly growing cells, including cancer cells." (OPC Ex. 4 at 11.) He quotes the researchers' statements that,

> 'exposure to . . . 60 Hz EM [electromagnetic] fields may serve as a tumor-promoting stimulus in a manner analogous to the well-defined action of phorbol ester compounds since both stimuli are capable of elevating ODC activity and both act synergistically at cell membrane receptor sites. The EM fields are not [cancer] initiators . . . . . However, compared to TPA (a phorbol ester, tetradecanoyl phorbol acetate), . . . the 60 Hz fields result in a highly significant, but relatively modest increase in cellular ODC activity.' (Id.)

Dr. Polk also noted that the Byus et al. studies may be another example of an amplitude window, where effects are observed at some field intensities but not others. (Id. at 12.)

Howard County witness Phillips believes the Byus studies are important "because they indicate an effect of electric fields on ODC activity in the first place, an effect on ODC of a magnitude comparable to known tumor promoting agents. Secondly, the studies indicate an effect in conjunction with the effect observed with known tumor promoting agents." (HC

Ex. 2 at 31.) Dr. Phillips does, however, quote the authors of the study who acknowledge that the suggestion that exposure to low energy electric/magnetic fields may promote the formation of tumors "is entirely speculative." (HC Ex. 2 at 29.)

PEPCO witness Boutwell testified that the import of ODC activity as an essential component of cancer promotion was discovered in his laboratory; he also noted that he has published more than 50 papers on ODC. (PEPCO Ex. 27 at 7-8.) According to Dr. Boutwell, ODC (which exists in all cells) "is responsible for production of chemicals . . . which play a role in control of cellular growth . . . . Increased ODC levels are thus also associated with regulated cellular growth, such as that found during normal growth, or during wound healing." (Id. at 6.) Dr. Boutwell stated, however, that "with true cancer promoters, the increase in ODC is 10,000% or greater. Byus and Adey found only a 5-fold increase. This small increase in ODC levels does not even suggest a cancer promotion effect." (Id.) Moreover, while the Byus and Adey study indicated effects (increased ODC activity) after a one hour exposure, Dr. Boutwell stated that "[w]ith true cancer promoters, the time frame for ODC induction is much longer." (Id.) Such a response after a relatively short exposure "is simply too rapid for the mechanisms of cancer promotion to have occurred." (Id.) Finally, Dr. Boutwell testified that with true cancer promoters, the effect of increased ODC activity would not have disappeared within the 1-3 hours noted by Byus and Adey. (Id. at 7.)

DNR/Staff witness Bailey testified that the relevance of the Byus and Adey studies is dubious. Like Dr. Boutwell, he noted that "[a]n increase in ODC activity accompanies the growth of both normal and transformed cells." (DNR/Staff Ex. 6 at 41.) According to Dr. Bailey, "scientists have cautioned about the use of increased ODC activity as a marker of tumor induction, because many physiological stimuli are known to affect the ODC activity of cells but these stimuli are not tumor promoters." (Id.) In Dr. Bailey's opinion, "the effects of electric fields on ODC activity are likely to be complex and independent of any potential tumor promoting or growth stimulation effect." (DNR/Staff Ex. 5 at 38.)

In addition to commenting upon studies reported in the scientific literature, Howard County witness Phillips discussed research efforts performed in his laboratory. Dr. Phillips stated that, "[w]e are particularly interested in the effect of magnetic field exposure on the expression of the cell's genetic information . . . ." (HC Ex. 1 at 6.) In these studies, colon cancer cells were exposed to electric fields, magnetic fields, and combined electric/magnetic fields (Id. at 9); the magnetic field strength used in the experiments was 1,000 mG (Tr. at 524). According to Dr. Phillips, his initial studies "found that cells exposed to either electric and magnetic fields together or magnetic fields alone demonstrate an increased growth . . . from two to twenty-four times greater than that observed in our control group." (HC Ex. 1 at 9.) In

subsequent studies, he "discovered changes in the expression of a protein on the surface of the electromagnetic field exposed cells that was consistent with the increased growth demonstrated by these cells." (Id.) He also claimed that "cells exposed to electromagnetic fields were significantly more resistant to destruction by a . . . part of the body's normal defense system and known as a natural killer cell." (Id. at 9-10.) Finally, Dr. Phillips testified that "all of these changes . . . were permanent." (Id. at 10.)

After describing the three stages of the development of cancer (initiation, promotion, progression), Dr. Phillips stated that his studies have implications for the progression stage. In this phase, "increasingly diverse cancer cells with enhanced survival and growth characteristics [emerge]." (HC Ex. 1 at 11.)

The studies conducted by Dr. Phillips were critiqued in the NYSPLP Panel Report; as well as by PEPCO witnesses Israel, Boutwell and Bockman; and DNR/Staff witness Bailey.

According to the NYSPLP Panel Report, the NYSPLP contracted with Dr. W. D. Winters to conduct a study on the effects of electrical, magnetic, or mixed fields on cells derived from the canine and human immune systems. (Born/Murch Ex. 1 at 23, 88.) Subsequently, "[o]n his own initiative" (Id. at 132), Dr. Winters took the equipment used in his own experiments and provided it to Dr. Phillips for use in his laboratory to expose colon cancer cells to electric and magnetic fields.

(Tr. at 546.) Dr. Phillips testified that Dr. Winters' participation in the studies was limited to supplying the equipment and supervising exposure of the cells. (Tr. at 547.)

The NYSPLP Panel believed it necessary to extensively discuss the Phillips' studies because,

> • this work was made possible by funding under the New York program which was used to construct the exposure apparatus and to support Dr. Winters and his laboratory;
>
> • [and because] public concern was generated by these investigators' claims that magnetic fields stimulate growth of tumor cells in soft agar. (Born/Murch Ex. 1 at 67.)

Since the studies were not a part of the original contract between the NYSPLP and Dr. Winters, the NYSPLP hired outside consultants to conduct a site visit and review the experimental design and data of the Phillips' experiments. (Born/Murch Ex. 1 at 5.) Dr. Phillips testified, however, that he did not participate in the site visit because the NYSPLP had not funded his work. (Tr. at 544.) He further testified that he did not know what data was presented to the site team by Dr. Winters (Tr. 552), and that because of a falling out with Dr. Winters, his laboratory did not provide Dr. Winters with data after the preliminary, early experiments (Tr. at 548). Dr. Phillips also asserted that whatever data was presented by Dr. Winters to the NYSPLP site team could not

have been the same as that included by Dr. Phillips in a 1986 article published in the International Journal of Radiation Biology. (Tr. at 577.) This is because, after April 1984, Dr. Winters was not privy to any of Phillips' raw data, and the data included in the journal article was generated later in the studies. (Tr. at 577-578.)

The NYSPLP Panel criticized the Phillips' study, stating that, "[i]ncreased cloning in soft agar is far more meaningful if observed for normal cells than for tumor cells, since tumor cells already have the capability of division prior to exposure." (Born/Murch Ex. 1 at 67.) Another criticism was that the "cloning in soft agar test would not have been the assay of choice in investigating the effects of electromagnetic fields on cancer induction and/or promotion for a variety of reasons . . . . " (Id.)

With respect to Dr. Phillips' claim regarding a dramatic increase in clonogenicity of cancer cells in soft agar following exposure to magnetic fields, the Panel noted that this claim was based on one of the first 27 experiments and that "[o]ther increases reported after exposure were not startling given the obvious variability even among controls (See also Phillips et al., 1986a and b)." (Id. at 68.) The Panel's cite to "Phillips et al., 1986a and b" is to two articles: one published in the International Journal of Radiation Biology 49: 463-469, 1986a; and the other in Cancer Research 46: 239-244, 1986b. (Born/Murch Ex. 1 at 148.)

"Because of the possibility that [Phillips'] results were artifactual, that is, were related not to field exposure but to the inherent variability of the cloning assay . . ." (Id. at 132-133), the NYSPLP contracted with two researchers to replicate the experiments. "Using the same cell lines . . . (but a slightly different field geometry)" Dr. Hamburger and Dr. Cohen "concluded that neither magnetic or magnetic plus electric fields affected clonogenicity in soft agar of either [colon cancer] cell line." (Id. at 5.)

The Panel Report stated that "[e]ven if [Phillips'] results are valid they cannot be extrapolated to cancer growth in humans, because ability of tumor cells to grow in soft agar has only loose, if any, to [sic] behavior of tumor cells in the intact organism." (Id. at 69.)

In its Summary section, the Panel concluded that further replications of this type of study,

> are not warranted because: (1) electric and magnetic fields have not been observed to induce transformation in normal cells, (2) exposure of two cancer cell lines in two different laboratories do not provide convincing evidence of an effect of biological significance, and (3) extrapolations from the behavior of cancer cells in soft agar to intact organisms cannot be made. Extrapolation of possible field effects on cancer should be done with more relevant assays. (Id. at 133.)

PEPCO witness Israel discussed soft agar clonogenicity studies in general, and Dr. Phillips' studies in particular. Dr. Israel stated that soft agar cloning is a "simple

tissue culture test that measures the ability of cells to form colonies when grown in a gelatinous medium known as soft agar." (PEPCO Ex. 23 at 2-3.) It is also a "relatively inexpensive means of screening for potential carcinogens." (Id. at 3.) With respect to Dr. Phillips' study, Dr. Israel noted that it "reported an increase in cell colony formation, not an increase in the rate of cell growth." (Id. at 10.) Dr. Israel asserted, however, that there is "no correlation between the efficiency of cancer cell colony formation in soft agar and any known parameter of importance for investigators studying the development of cancer or for physicians caring for cancer patients." (Id.) Contrary to Dr. Phillips' assertions, Dr. Israel testified that the data sets of Dr. Phillips which were reviewed by the NYSPLP are the same as those published under Dr. Phillips' name in various peer-review journals and symposia materials. (Tr. at 196-198.) Finally, Dr. Israel testified that he does not "see a usefulness for the Phillips study [because it] . . . is poorly designed and not very helpful . . ." (Tr. at 205.)

PEPCO witness Bockman also commented on Dr. Phillips' studies, referring specifically to the latter's testimony on "natural killer cells." (PEPCO Ex. 28 at 3.) Dr. Bockman explained that such cells,

> are a part of the body's immune system that are capable of killing several types of cell targets . . . [they] do not depend on "individual-specific recognition molecules." Instead, [they] . . . can attack cancer cells at other sites on the surface

of the cancer cells. These sites are called transferrin receptor sites. (Id.)

Dr. Bockman stated that the reports by Dr. Phillips that his studies indicated an increase in transferrin receptors and increased resistance to natural killer cells "is directly contrary to the accepted teachings of immunology." (Id. at 4.) According to Dr. Bockman, "it is commonly accepted in immunology that an increase in transferrin receptors . . . will cause results opposite to those which Phillips suggests. That is, an increase in transferrin receptors decreases resistance to natural killer cells rather than increases resistance." (Emphasis in original.) (Id.) Dr. Bockman further noted that Dr. Phillips' results have not been replicated. (Id.)

PEPCO witness Boutwell also discussed the studies of Dr. Phillips, stating that the "methodology of this research is simply inappropriate for the study of cancer promotion." (PEPCO Ex. 27 at 8.) More specifically, Dr. Boutwell noted that the cells used in the study had "already undergone all of the important steps in the transformation from normal to cancerous cells prior to exposure. A study designed in this way cannot yield useful data about the effect of exposure on the initiation, promotion or progression of cancer." (Id. at 9.)

DNR/Staff witness Bailey commented upon the studies by Dr. Phillips, stating that he was familiar with the four articles which have appeared in journals regarding this work, as well as the Cohen (1987) study funded by the NYSPLP to

replicate Dr. Phillips' experiments. (DNR/Staff Ex. 6 at 24.) Dr. Bailey testified that he agreed with the NYSPLP Panel conclusion that Dr. Phillips' experiments were not supported by the data. (Id.) He also testified that the results (data) published by Dr. Phillips in the peer-review journals were substantially the same as those contained in the NYSPLP Report. (Id.)

2. Epidemiological Studies of Cancer.

In 1979, a case/control study of childhood cancer in Denver, Colorado was reported by Wertheimer and Leeper. The study "indicated that children living in homes near power lines or other electric transmission facilities or in homes with elevated electromagnetic fields run a higher risk of cancer." (Born/Murch Ex. 1 at 72.) The electromagnetic fields in the homes under study were not measured but, instead, estimated by means of a "wiring code." Homes were classified as either "high-current configuration" or "low-current configuration" based on the thickness of the distribution line wires nearby, as well as the distance of the wires from those homes. (DNR/Staff Ex. 5 at 25.) According to DNR/Staff witness Bailey, "[t]he inference that Wertheimer and Leeper drew from their data was that the size of the magnetic field produced by the utility wiring was associated with disease rate." (Id.)

A 1986 study by Tomenius (conducted in Stockholm, Sweden) investigated "childhood cancer in relation to both (a) distance from 'visible electrical constructions,' which included overhead transmission lines, and (b) the magnetic field measured (these were spot measurements) outside of the homes of all study subjects." (Id. at 28.) According to Dr. Bailey, Tomenius reported that "children with cancer were more likely than children without cancer to live within . . . (about 500 feet) of overhead power lines." (Id. at 29.) The NYSPLP Panel observed that the Tomenius results indicated an elevated risk for central nervous system tumors and all childhood tumors, but no excess risk for childhood leukemia. (Born/Murch Ex. 1 at 77-79, 86.)

A study by Savitz (1987) was funded by the NYSPLP "to repeat the original study by Wertheimer and Leeper, and also improve and evaluate certain aspects of the study design." (Id. at 82.) Like Wertheimer and Leeper, Savitz conducted his study in Denver, Colorado. Exposure to electric/magnetic fields was estimated by (1) use of the Wertheimer and Leeper code to classify the wiring configuration outside the home, and (2) direct spot measurements within the home. (Id. at 9.) The spot measurements were taken under high-power conditions (with lights and appliances turned on) as well as low-power conditions (with as much electricity as possible turned off). (Id. at 82.)

In describing the findings of the Savitz study, the NYSPLP Panel Report states that:

> [a]t the time of the diagnosis, low-power-condition magnetic fields (appliances turned off) as well as wire codes showed an association with cancer risk that was most pronounced for leukemia. High-power-condition magnetic fields (appliances turned on) did not show an association, nor did any exposure characterization at the time of birth. (Id. at 84.)

Dr. Polk cited the Wertheimer and Leeper, Tomenius, and Savitz studies as influencing his views on the issue in this case. Dr. Polk stated that he believed the three studies were consistent in suggesting an above-expected incidence of cancer in children with long-term exposure to magnetic fields greater than 2 to 3 mG. (OPC Ex. 5 at 17.) Dr. Polk also observed, however, that while "the data seem to indicate there may be an association [between disease and magnetic fields above 2.5 or 3 mG]," the association "of course could be due to other causes. I don't know at this point." (Tr. at 300.)

Based upon a study by Kaune (1987), Dr. Polk stated that he believes the Wertheimer and Leeper wire codes predict "reasonably, although imperfectly, average magnetic field levels." (OPC Ex. 4 at 15.) Dr. Polk quotes other investigators who have found the wire code to be "'a useful method for making a first-order approximation to predict long-term, low-level magnetic fields in residences.'" (OPC Ex. 5 at 14.) He also believes that wire codes may be a better indication of long-term, historical magnetic field exposure than current spot-

field measurements which can be affected by "recent home wiring changes or purchase of new appliances." (OPC Ex. 4 at 15.)

Dr. Phillips also refers to epidemiological studies as indicating a possible association between long term exposure to magnetic fields as low as 2 to 3 mG and an increased incidence of cancer in adults and children. (Tr. at 631.) While recognizing certain critiques of the wire code as an index of exposure, Dr. Phillips testified that "measured magnetic fields have been found to be a less reliable predictor of long time exposure to magnetic fields than the wiring code configuration . . . ." (HC Ex. 2 at 14.) As a result, Dr. Phillips gives more credence to those findings of Savitz which showed a correlation between wire code estimated magnetic fields and childhood cancer than those findings which showed no statistical significance (at the 5 percent confidence level) between measured magnetic fields and elevated cancer risks. (Id. at 14-15.)

Dr. Phillips also discussed the question of dose-response in the three studies. In the Wertheimer and Leeper study, "a positive dose response gradient with higher levels of exposure was seen." (Id. at 19.) The Tomenius study "suggests a threshold with . . . consistently more effect above the threshold." (Id.) And, "a dose response of sorts was seen with the Savitz study." (Id.) Dr. Phillips observed, however, that,

> the problem with these studies is that in looking for a dose response, you have to know the dose of what you are looking for.

> It has been impossible to estimate with reliability and accuracy what an individual's prior exposure to low level electromagnetic fields has been . . . . So until laboratory scientists can tell epidemiologists that these are the parameters of interest, it will be impossible to look for an appropriate dose response. (Id.)

As funding source for the Savitz study, the NYSPLP Panel Report extensively discussed the study's findings and implications. Initially, the NYSPLP Panel Report noted the limitations of seven previous epidemiological studies (including the Wertheimer and Leeper, and Tomenius studies), particularly regarding the approaches for defining exposure: wiring configuration, point-in-time field measurements, and distance between a home and an identified transmission facility. (Born/Murch Ex. 1 at 72-75.) More specifically, the Panel states that wiring codes have been criticized for: ignoring sources other than power lines and producing estimates that correlate poorly with the true fields. (Id. at 73.) The point-in-time measurements have been criticized because of considerable variations in magnetic fields over time. (Id.) The third approach, using the distance between a home and an identified transmission facility, is considered a "crude variant" of a wire code. (Id. at 75.)

Additional problems with the Wertheimer and Leeper and Tomenius studies were identified by the Panel. With respect to the former, the study was not done "blind," giving rise to a concern that such a bias could produce spurious ef-

fects. (Id. at 75.) The Panel noted that the "authors have made some attempts to evaluate the magnitude of this possible bias, but its importance remains unclear." (Id.) With respect to the Tomenius study, the Panel observed that it failed to indicate:

> whether or not field measurements for cases and controls were made within the same time periods. If case and control measurements are not uniformly distributed over time, a bias could certainly arise in any direction because of time variation in electricity use. (Id.)

In reviewing the Savitz research, the Panel stated that "one major difficultly with this study is the limited response rate." (Id. at 83.) Of the "cases," 71 percent were interviewed; while for "controls," the response rate was 62 percent. (Id.) The Panel noted that because "magnetic fields could only be obtained for interviewed subjects, the limited response rate affected . . . all analyses using field measurements." (Id.) The Panel also found, however, that "[a]n important finding [of the Savitz study] was a correlation between magnetic field measurements and wire codes." (Id. at 82.)

The implications of the Savitz study were discussed by the Panel.

> The incidence rate of childhood cancer is approximately 1 per 10,000 per person year. If the association with magnetic fields seen by Savitz is causal with a relative risk of about 2, then, depending on level of exposure, the incidence rate for the exposed group would be increased to 2 per 10,000 per person year. (Id. at 85.)

Although the Panel interpreted the Savitz study as "basically . . . being positive," it said it was "important to note that there are some internal inconsistencies."(Id. at 84.) Specifically,

> [t]he results seem to depend upon what exposure measure is used, e.g., no effect at all is seen when the high-power-condition measurements were used, and in some instances there are considerable differences between the results based on the wire coding and the results based on the low-power-condition measurements. Furthermore, although the highest exposure categories display the highest relative resks [sic], there is no clear dose-response relationship over the remaining exposure categories. (Id.)

The Panel observed that when childhood leukemia is considered alone, "there is more randomness and the findings are less consistent . . . ." (Id. at 86.) Numbers for childhood brain tumor findings are even smaller. (Id.) While recognizing the implications of the Savitz study, the Panel noted that "research in basic sciences has not revealed any mechanisms that could explain the role of the magnetic fields in the origin of cancer." (Id.)

In its Summary section, the Panel discussed the Savitz study as basically confirming the results of the previous epidemiological studies. While finding that "the causal relationship is still no more than an hypothesis . . . the basis for this hypothesis is now stronger." (Id. at 132.) The Panel listed three reasons why the hypothesis is still unset-

tled: "1) we still only have one well designed study, 2) there are unresolved questions in the Savitz study, and 3) there is no basic mechanism known to explain a causal relationship." (Id.) The Panel observed, however, that,

> [i]f future research confirms a causal association between 60-Hz magnetic fields and childhood cancer public health considerations would have to be developed from 1) baseline risk of childhood cancer, 2) risk increase due to field exposure, and 3) distribution of exposure in the population. (Id.)

PEPCO witness Tucker also discussed the Wertheimer and Leeper, Tomenius, and Savitz studies. With respect to the Wertheimer and Leeper study, Dr. Tucker stated that she is skeptical of its reported findings, noting that the study has been "widely criticized because of multiple flaws in the design, execution, and analysis of the study." (PEPCO Ex. 26 at 2.)

With respect to the Tomenius study, Dr. Tucker testified that "[t]he pattern of data reported in the Tomenius study is that cancer risk decreased with increasing magnetic field exposure and also decreased the closer a home was to electric power lines." (Id. at 5.) In her opinion, the results "demonstrate the inconsistency between studies looking for an association between exposure to electric and/or magnetic fields and cancer." (Id.)

Dr. Tucker stated that the observations of the NYSPLP Panel Report concerning the Savitz study were based upon pre-

liminary analyses of data. According to Dr. Tucker, a more relevant analysis appears in a 1988 article by Savitz in the American Journal of Epidemiology. (Id. at 5-6.)

> In that article, there is no evidence of a dose-response relationship between the actual measured electric or magnetic fields and childhood cancer; in fact, none of the risk ratios between measured electric and magnetic fields were significant nor was there a significant trend toward increasing risk with increasing measured electric or magnetic fields. (Id. at 6.)

When an analysis is made using the wiring code, Dr. Tucker observed that a dose-response relationship is obtained only when different types of cancers are combined and considered together. (Id.) She added however, that grouping cancers together,

> does not make biological sense because different types of cancer are caused by different types of exposures . . . . In an epidemiological study, specific types of cancers should be separately analyzed; when that is done in the Savitz study, there is no evidence of a dose-response relationship even based upon wiring code. (Id.)

According to Dr. Tucker, the Kaune study (1987) found only "a weak correlation between the wiring code and actual measured electric and magnetic fields." (Id. at 4.) This finding is important to Dr. Tucker "[s]ince the correlation between wiring codes and actual measured electric and magnetic fields is weak, the wiring code does not appear to be an accurate measure of the actual fields in the house." (Id.) She further

testified that, "[i]f magnetic and electric fields were associated with cancer risk, one would see a stronger relationship with the actual measured fields than with a surrogate (wiring code), which is poorly correlated with the measurements." (Id.)

Finally, Dr. Tucker cited the study by Stevens (1987) (also funded by the NYSPLP) as showing no association between adult acute leukemia and either wiring codes or measured electric/magnetic fields in the home. (Id. at 4.)

DNR/Staff witness Bailey also discussed the Wertheimer and Leeper, Savitz, Tomenius, and Stevens studies. (DNR/Staff Ex. 5 at 24-29; DNR/Staff Ex. 6 at 18-21.) With respect to the Wertheimer and Leeper study, Dr. Bailey noted various criticisms including: exposure of people from sources other than distribution lines was not taken into account; a failure to classify cases or controls "blindly;" and a failure to "consistently apply correct statistical analyses to the data." (DNR/Staff Ex. 5 at 26.)

In discussing the Savitz study, Dr. Bailey testified that when "measured magnetic fields were used as the index of exposure, the associations with disease were low to non-existent, and none were statistically significant." (Emphasis added.) (Id. at 27.) According to Dr. Bailey, when wiring configuration was used as the index of exposure, the "magnetic field strength in the home was weakly correlated with wiring configuration, and . . . disease was slightly but significantly associated with utility wiring configuration." (Id. at 27-28.)

Separate studies by Savitz (1987a) and Kaune et al. (1987) indicate to Dr. Bailey that magnetic field strength is only "loosely" associated with wiring configuration. (Id. at 28.) In Dr. Bailey's opinion, a wire code is not a reasonable predictor of measured magnetic fields. This view is based upon the Kaune (1987) study which showed that only 16 percent of the variance of the data can be explained by the correlation between the Wertheimer and Leeper codes and measured magnetic field levels. (DNR/Staff Ex. 6 at 18.) In Dr. Bailey's opinion, a "wire code that cannot explain the majority (84 %) of the data is not a 'reasonable' predictor." (Id.) Similarly, with respect to the Savitz study, the coefficient of correlation was 0.36, indicating to Dr. Bailey that "the Wertheimer-Leeper wiring codes are not reasonable predictors of average magnetic field levels." (Id. at 19.) Dr. Bailey testified that there is no data "that supports the accuracy of wire codes as an index of magnetic field levels over periods up to 10 years in the past." (Id.)

Dr. Bailey also cited the study by Stevens (1987) which was designed to investigate a possible association between exposure to electric/magnetic fields and adult acute non-lymphocytic leukemia. (DNR/Staff Ex. 5 at 28.) Like Savitz, Stevens used both wiring configurations as well as spot measurements to determine magnetic field exposure. According to Dr. Bailey, Stevens found no association between the incidence

of adult cancer and either wiring configurations or measured magnetic fields. (Id.)

With respect to the Tomenius (1986) study, Dr. Bailey observed that the closer the residences were to the line, the lower the risk of cancer. (Id. at 29.) Dr. Bailey testified that "[a]lthough the number of people near the line was too small to produce a statistically significant result, this observation is not consistent with a magnetic field effect." (Id.) Dr. Bailey noted that Tomenius "also reported that homes with spot-measured magnetic fields of 3 milligauss or more (regardless of the distance of the home to the line), had a statistically significant excess of cancer." (Id.) Dr. Bailey cautioned however, that:

> if any cutoff value except 3 milligauss (which Tomenius selected on a post hoc basis, which violates good scientific practices) had been used, the results would not have achieved statistical significance. Thus, the significance of this reported association between magnetic field exposure and incidence of cancer is questionable. (Emphasis in original.) (Id.)

In rebuttal testimony, Dr. Phillips criticized the Stevens study cited by both Dr. Bailey and Dr. Tucker. (HC Ex. 2 at 16-17.) Dr. Phillips stated that Wertheimer and Leeper have noted a serious flaw in the study: that is, a number of individuals in the control group were exposed to low level magnetic fields on a chronic basis through the use of electric blankets, electric mattress pads or electric waterbed

heaters. (Id. at 16.) The effect of such a misclassification would be to take an actual positive result and bring it toward the null (that is, no effect). (Id. at 16-17.) Dr. Phillips did not provide a cite for the Wertheimer and Leeper critique of the study by Stevens.

In addition to the residential epidemiological studies, several of the expert witnesses discussed various occupational epidemiological studies investigating an association between electric/magnetic fields and adverse health effects. Dr. Polk cited, but did not discuss, studies by Milham (1982), and by Pearce et al. (1985) (1988) as showing an increased risk of cancer from occupational exposure to electric and magnetic fields. (OPC Ex. 5 at 8.)

Dr. Phillips agreed "to a point" with the observation by Dr. Bailey that some researchers who have performed occupational epidemiological studies have "failed to control their data for the potential confounding effects of chemical exposure that are inherent in most of the occupations studied." (HC Ex. 2 at 22.) He added however, that it would be difficult to come up with one or more confounders that could explain the more than 30 occupational studies which "have found an apparent association between increased exposure to electromagnetic fields or presumed exposure to electromagnetic fields and the increased incidence of cancer in the exposed group." (Id.)

DNR/Staff witness Bailey testified that of the approximately 30 studies conducted over the past seven years, the

results have been mixed with some reporting "elevated cancer rates in those working in electrical occupations, and other studies reporting no association . . . ." (DNR/Staff Ex. 5 at 30.) Dr. Bailey cites two problems with such occupational studies: none have included measures of magnetic field exposure, and most have failed to control their data for the potential confounding effects of chemical exposures. (Id. at 30-31.) With respect to the first, Dr. Bailey notes that the studies have relied upon job titles to assess whether there was probable exposure to electric/magnetic fields without confirming whether job title is a reasonable surrogate for exposure. (Id. at 30.) As an example, Dr. Bailey cites a study by Lin et al. (1985) which classified electrical engineers as among the most exposed of all workers considered; another study, by Milham (1985), excluded such workers from consideration. (Id.) With respect to the second problem, Dr. Bailey cited a study by Thomas et al. (1987) which showed that an increased risk of brain cancer among electrical and electronics workers was more specific to those in jobs which involve exposure to soldering fluxes and other chemicals than to those workers classified as electricians, power linemen and servicemen (who would presumably have a higher exposure to 60 Hz electromagnetic fields as well as a lower exposure to confounding agents such as chemicals). (Id. at 31.) The NYSPLP briefly reviewed the occupational studies, noting that the majority are based on routinely collected information. (Born/Murch Ex. 1 at 81.) As a result,

"very limited information is available about the study subjects and only crude analysis . . . is usually presented." (Id.) The Panel also notes that little information about exposure to electric/magnetic fields or other possible risk factors is available in such studies. (Id. at 81-82.) However, in spite of the studies' limitations and erratic findings, the Panel found that "there is a certain consistency between the results." (Id. at 82.) The Panel goes on to note that,

> [i]t seems more likely that these occupations are at an increased risk of leukemia than that a random phenomenon is observed or that some sort of bias is operating. If these "electrical" occupations are in fact at increased risk, whether or not the explanation is known, then it seems warranted to include long-term exposure to magnetic fields on the candidate list. (Id.)

PEPCO witness Tucker also discussed epidemiological studies which have investigated occupational exposure to electric and/or magnetic fields and cancer. (PEPCO Ex. 24 at 13-14.) Dr. Tucker testified that many of these studies "lumped together" leukemia which "is a number of different diseases with different etiologies." (Tr. 685.) In her opinion, it is inappropriate to lump them together; "if you look at those studies alone and try and associate a risk of that particular type of leukemia with a specific job title, there is no consistency among the studies, the same is true with brain cancer." (Id.)

## III. DISCUSSION AND CONCLUSIONS

The Commission's purpose in reopening this case was to receive and consider evidence concerning the health effects, if any, associated with the electric/magnetic fields which would be produced by PEPCO's certificated, but not yet constructed, Brighton-High Ridge 500 kV transmission line.

PEPCO takes the position that the certificated Brighton-High Ridge line is not unique, that there is no scientific basis for believing that the electromagnetic fields produced by the line would cause any adverse health effects and that, accordingly, PEPCO should be allowed to proceed with construction of the line as designed. (PEPCO Initial Brief at 30-31.)

DNR and Staff assert that the evidence does not support a conclusion that electromagnetic fields produce adverse health effects. (DNR/Staff Initial Brief at 46-47.) In spite of this conclusion, DNR/Staff acknowledge that certain studies show a correlation between exposure to electric and/or magnetic fields and certain biological effects. As a result, they believe that additional research is warranted. (Id. at 47.) DNR/Staff do not believe any "interim protection" is necessary since: they expect that additional research will confirm their view of an absence of any adverse effects; they do not know how such interim protection could be afforded; and, fields from transmission lines are no more harmful than fields

from other sources. (Id.) Instead, DNR/Staff recommend that the Commission periodically monitor the scientific evidence so that if, at some time in the future, adverse health effects are proven to be caused by electromagnetic fields of power lines, the "Commission should consider establishing an appropriate state-wide design standard for distribution and transmission lines." (DNR/Staff Reply Brief at 33.)

The Office of People's Counsel makes several recommendations based upon the view that "it is impossible to say with certainty that transmission lines do not cause health problems." (OPC Initial Brief at 45.) First, OPC recommends that the Commission direct PEPCO to investigate the feasibility of reducing the magnetic fields of the Brighton-High Ridge line through design modifications. (Id. at 46.) OPC next asks that the route of the certificated line be reconsidered; OPC believes that "a route which is further away from residences would be preferable." (Id.) Finally, OPC suggests that the Commission consider the possibility of expanding the certificated right-of-way. (Id.)

Howard County takes the position that "electromagnetic fields are associated with or cause adverse effects in biological systems that have possible and serious implications for human health." (HC Initial Brief at 33.) Like OPC, Howard County recommends that PEPCO analyze line configurations in an effort to reduce magnetic field exposure to the greatest extent possible. (Id. at 34.) In addition, it suggests that the bene-

fit of the line and routing alternatives be reexamined, and that the evidence produced in this proceeding be reviewed by experts or individuals untainted by financial or partisan influence. (Id. at 34-35.) Finally, Howard County asks that the Commission delay construction of the line until its recommendations have been fulfilled and an additional opportunity for comment has been granted to all parties. (Id. at 35.)

Maple Lawn Farms recommends that "no further certificate of necessity should be granted until this area [health effects of electromagnetic fields] is further investigated." (MLF Initial Brief at 9.) It also suggests that if the Commission reaffirms this line, the right-of-way should be widened to "create a more safe distance from residential properties." (Id. at 10.)

Born/Murch "request again that the Commission analyze all data available on the issue involved here and bring in these expert witnesses to testify in hearings specifically reopened for that purpose." (Born/Murch letter of April 26, 1989, at 2.) Further, Born/Murch believe that requiring a wider right-of-way is not the proper answer and that limiting the magnetic field strength at the edge of the ROW as an interim step is insufficient. (Id. at 7.) Instead, they recommend a cordon sanitaire for transmission lines so that magnetic field exposure in any home be limited to 2 to 3 mG at this time. (Id.) They further suggest monitoring of loading currents, imbalance, and actual magnetic fields at home sites by a unit of

the Commission or the Office of People's Counsel. (Id.) Finally, Born/Murch ask that the line be rerouted so that no homes are within 500 feet of the edge of the ROW or, at least, a route be selected that affects fewer homes than does the present route. (Id.)

The expert witnesses in this case agree that a causal relationship has not been established between exposure to electric and/or magnetic fields and adverse health effects. There are, however, studies which show a variety of effects on biological systems from exposure to such fields. A significant amount of evidence concerning these studies was admitted into the record during the course of this proceeding. However, the evidence is inconclusive as to whether these effects are a cause for concern.

For example, both the Bawin and Adey, and Blackman studies (see supra at 23-25) showed movement of calcium ions across the cellular membranes of chick brain tissue after exposure to electric and/or magnetic fields (HC Ex. 2 at 10). According to OPC witness Polk and Howard County witness Phillips, these studies indicate a possible "mechanism of interaction" between electric/magnetic fields and adverse health effects. However, neither the authors of the cited studies nor others have shown that such ion movement is, in fact, related to adverse health effects. (PEPCO Ex. 28 at 10.) Other studies, such as one by Albert et al. (DNR/Staff Ex. 5 at 22), have shown no change at all in calcium efflux. Because the results

of the various studies are contradictory, factors other than electric or magnetic fields may be involved. To draw any firm conclusions regarding the studies' significance with respect to the question herein appears unjustified at this time.

The import of the Byus et al. studies regarding ODC (see supra at 42-44) is also questionable. Both Dr. Polk and Dr. Phillips cite this study as indicating that cells exposed to electric/magnetic fields may produce cellular abnormalities and, thereby, promote cancer (OPC Ex. 4 at 11; HC Ex. 2 at 29-31). However, neither Dr. Polk nor Dr. Phillips challenged or rebutted PEPCO witness Boutwell's prefiled testimony which specifically contradicted such a conclusion. According to Dr. Boutwell, "neither the magnitude of the rise in ODC, the time to achieve a maximum response, nor the return to normal levels within 3 hours is consistent with a cancer promotion effect." (PEPCO Ex. 27 at 7.) In consideration of Dr. Boutwell's extensive experience with ODC in cancer research (Id. at 6), as well as the substance of his unchallenged testimony, I find his views regarding the import of the Byus study to be persuasive. Thus, I do not believe that the Byus study supports a finding of adverse health effects for humans from exposure to electric and/or magnetic fields.

With respect to the Henhouse Project (see supra at 32-36), the witnesses for OPC and Howard County believe the studies implicate magnetic fields as the cause of abnormalities in chick embryos (OPC Ex. 4 at 5-6; Tr. at 621). However, both

frequent, and not necessarily adverse. (Tr. at 210; DNR/Staff Ex. 6 at 26; PEPCO Ex. 23 at 12.) Dr. Bailey was particularly wary of extrapolating the results of experiments on the salivary glands of fruit flies to humans. (DNR/Staff Ex. 6 at 26.)

While the Goodman and Henderson studies may indicate that cells exposed in vitro to a 15 Gauss magnetic field are different from non-exposed cells, it has not been shown that the changes are adverse, or that the changes would occur in vivo. Moreover, a multigenerational study by Carsten and Benz of mice exposed to electric/magnetic fields (see supra at 37-39), reported no adverse effects. Unless it is shown that changes in in vitro cells are occurring in vivo, are adverse, and are occurring at magnetic field strengths associated with electric power lines, the Goodman and Henderson study is not a basis for a finding of adverse health effects.

The studies conducted by Howard County witness Phillips were highly controversial (see supra at 44-51). Dr. Phillips claimed that his studies showed that colon cancer cells exposed in vitro to a 1,000 mG magnetic field: demonstrated increased growth, were significantly more resistant to the body's defense system, and appeared to be permanently changed. (HC Ex. 1 at 9-10.)

The evidence presented to counter these assertions was extensive. Several witnesses cited the analysis by the NYSPLP Panel Report as confirming their own views on Dr. Phillips' study. Specifically, the witnesses and Panel Re-

Dr. Polk and Dr. Phillips ignored various factors cited by witnesses for PEPCO and DNR/Staff which could have affected the outcome of the experiments.

Specifically, the researchers in the six laboratories which participated in the Henhouse Project used a pulsed magnetic field (unlike fields produced by power lines), a small number of chicken eggs, and different sources for the eggs. (PEPCO Ex. 21 at 5.) An additional factor may have been the difference in temperature of the eggs (DNR/Staff Ex. 6 at 4.) In view of the deviations in the individual laboratories just noted, a recognition that other studies have reached contrary results (PEPCO Ex. 21 at 5), and the difficulty in extrapolating results from avian species to humans (Born/Murch Ex. 1 at 61-62.), I do not believe the Henhouse Project supports a finding of adverse health effects for humans from exposure to electric/magnetic fields.

Studies by Goodman and Henderson (see supra at 40-41) were cited by both Dr. Polk and Dr. Phillips as indicating that exposure to magnetic fields may affect protein synthesis and the transfer of genetic information in cells and, thus, may promote cancer. (OPC Ex. 4 at 9-10; HC Ex. 1 at 13; Tr. at 627.) The cells used in the Goodman and Henderson studies were the salivary glands of fruit flies; the magnetic field strength was 15 Gauss.

Both DNR/Staff witness Bailey and PEPCO witness Israel testified that changes in gene expression are normal,

port were critical of the study's design (Born/Murch Ex. 1 at 67; PEPCO Ex. 27 at 8; Tr. at 205; PEPCO Ex. 23 at 10), its reported data (Born/Murch Ex. 1 at 68; PEPCO Ex. 28 at 4), and its conclusions (Born/Murch Ex. 1 at 69; PEPCO Ex. 27 at 9).

Although Dr. Phillips carefully testified that he did not know what data was reviewed by the NYSPLP, he nevertheless asserted that the data could not have been the same as that cited in his journal articles. (Tr. at 548.) However, documentation was never offered by Howard County to verify this assertion. Instead, the record indicates that the NYSPLP did have available (and apparently did review) two of the journal articles written by Dr. Phillips (Born/Murch Ex. 1 at 68 and 148.) The testimony of Dr. Bailey and Dr. Israel, who had each reviewed the Phillips' data in both the NYSPLP and the journal articles, also contradicts Dr. Phillips' assertions. Attempts to replicate the Phillips' study by two different laboratories (funded by the NYSPLP) were not successful. (Id. at 133.)

The substantial criticisms of all aspects of the Phillips' study were not rebutted by Howard County. Accordingly, I do not believe the study supports a hypothesis that exposure to electric and/or magnetic fields promotes cancer.

In the view of Dr. Polk and Dr. Phillips, the epidemiological studies conducted by Wertheimer and Leeper, Tomenius, and Savitz (see supra at 51-63) support their views that exposure to electric/magnetic fields may result in adverse health effects. The three studies report an association between expo-

sure to electric and/or magnetic fields and an elevated risk of childhood cancer.

The evidence on the record regarding the Wertheimer and Leeper and the Tomenius studies indicates that the reported findings may be compromised by flaws in the studies' design, data, and/or analysis. For example, the Wertheimer and Leeper study was not conducted "blind" nor did it consider possible sources of magnetic fields other than power lines. (Born/Murch Ex. 1 at 75 and 73.) The problems with the Tomenius study included: (1) there was a decrease in cancer incidence the closer one was to the electric power line, contrary to what would be expected if the theory was correct (DNR/Staff Ex. 5 at 29; PEPCO Ex. 26 at 5); and, (2) the data of the study was tailored, on a post hoc basis, to obtain results using a specific mG cut off (DNR/Staff Ex. 5 at 29).

The record indicates that there are also problems with the Savitz study: (1) the response rate was limited (Born/Murch Ex. 1 at 83); (2) there was a lack of an effect under "high-power" conditions, contrary to what would be expected (Id. at 84); and (3) the findings are statistically different when the various types of cancer are disaggregated (PEPCO Ex. 26 at 6).

Although DNR/Staff witness Bailey and PEPCO witness Tucker made valid criticisms of the Savitz study, and the NYSPLP Panel Report noted certain internal inconsistencies, these critiques did not wholly rebut the study's findings. In

my view, until the Savitz study is confirmed or refuted by subsequent studies, it is a basis for uncertainty on the question of adverse health effects from exposure to low-level electric and/or magnetic fields.

Other studies, such as those by Salzinger (see supra at 31-32) and Wolpaw (see supra at 29-31) also leave doubts as to the long-term effects from exposure to electric/magnetic fields. The Salzinger study reported that prenatal exposure of rats to ELF fields "produces more or less permanent changes in response activity. The meaning of the effect is obscure . . ." (Born/Murch Ex. 1 at 123.) Although DNR/Staff witness Bailey was critical of the food-deprivation schedule used to motivate the rats (DNR/Staff Ex. 6 at 32), the significance of the study remains unclear.

In the Wolpaw study, although no significant effects on macaque monkeys from exposure to electric/magnetic fields were found, the Panel Report noted that the significant decrease in 5-HIAA leaves "unresolved the important question if the effects of fields on biologic amine metabolism correspond to abnormalities in learning or other behavior." (Born/Murch Ex. 1 at 115.) This concern was not shared by PEPCO witness Bockman who testified that after exposing laboratory animals to electric/magnetic fields, some researchers have found an increase in levels of 5-HIAA, some found a decrease, while others found no change. (PEPCO Ex. 28 at 6.) This lack of consistency

among the 5-HIAA studies further complicates an assessment regarding their significance.

In view of the inconclusive nature of some of the evidence in this case, certain parties have recommended that various interim measures be taken. In considering these recommendations, it may be instructive to review the actions taken by other states which have examined the possible association between exposure to electric and/or magnetic fields of transmission lines and adverse health effects.

Three states -- Florida, New York, and California -- have sponsored extensive reviews/investigations of this issue by administrative agencies or independent panels. Although each of these reviews has concluded that adverse health effects from such lines have not been established, the responses to this finding have differed.

In Florida, the State's Department of Environmental Regulation (DER) has adopted electric and magnetic field strength standards for new transmission lines and substations. In the section of the Florida Regulations entitled "Findings" (Department of Environmental Regulation, Chapter 17-274, Electric and Magnetic Fields), the DER states its intention "in no case to allow any new or modified line or substation . . . to cause electric or magnetic field strengths greater than those that now occur for existing transmission lines and substations." The Findings also state that:

> [a]lthough there is no conclusive evidence that there is any danger or hazard to public health at the levels of existing 60 hertz electric and magnetic fields found in Florida, there is evidence of a potential for adverse health effects on the public. Further research is needed to determine if there are effects and the exposure levels at which effects may occur.

In recognition of "a potential for adverse health effects," Florida's DER adopted regulations which set the following standards for electric and magnetic fields at the edge of new transmission line rights of way. For single circuit 500 kV lines: electric fields will be limited to 2 kV/m, and magnetic fields to 200 mG. For lines which are rated 230 kV and smaller, electric fields will be limited to 2 kV/m, and magnetic fields to 150 mG. (Id.) The basis of the magnetic field strength standards were "reasonable measures and status quo cap criteria . . ." (Id.)

In New York, the Public Service Commission initiated the NYSPLP in response to questions regarding possible adverse health effects from exposure to the electromagnetic fields of 765 kV transmission lines. The Final Report of the NYSPLP (which was introduced into evidence in this case) found that "[m]ost of the research studies reported no effects of concern. Of the few effects, some warrant further consideration." (Born/Murch Ex. 1 at 1.) The Panel concluded, however, that "[f]or several reasons, including the fact that a causal relationship between weak magnetic fields and cancer has not been established and that methodological uncertainties associated

with quantifying magnetic fields exposure levels exist, we cannot offer a recommendation based on the epidemiological studies." (Id. at 129.)

Recognizing the Panel's unwillingness to suggest concrete regulatory recommendations, the New York Public Service Commission, nevertheless, decided that "caution is warranted." (Order issued on April 12, 1988, in Cases 26529, 26559, and 27637, at 6.) Based upon that conclusion, the New York Commission stated that an interim magnetic field standard should be set "until a better determination can be made of the health hazards, if any, of exposure to magnetic fields." (Id.)

Consistent with an earlier decision establishing an electric field limit at the edge of transmission line rights-of-way, the New York Commission stated that magnetic fields of new transmission lines should be no greater than those typical of existing 345 kV lines operating throughout the State. (Id.) Based upon preliminary measurements of magnetic fields produced by 345 kV lines in New York, the New York Commission Staff has suggested an interim limit of 100 mG. (Id. at 6-7.) In explaining its decision regarding the interim electric and magnetic field standards, the Commission expressed the view that "society had implicitly accepted" the fields associated with 345 kV lines. (Id. at 3.)

In California, the Public Utilities Commission (PUC) in cooperation with the Department of Health Services (DHS) compiled a report on the potential health effects associated

with exposure to electric and magnetic fields from electric utility facilities. The report by the PUC/DHS reviewed the scientific studies to date and identified three research projects to receive state funding. In addition, the report made certain regulatory recommendations, including:

> California take no action at the present to regulate electric and magnetic fields around electric power facilities. Any such actions are premature given current scientific understanding of this public health issue. Too little is known presently to be able to determine where or what rules would provide useful protection. Existing research data are not sufficient for adequate accurate risk assessment. We do not know which components, if any, of electric power utility operations pose significant health hazards. Although biological effects are clearly established, the relationship of these effects to possible public health risks is not yet established. (Potential Health Effects of Electric Power Facilities, California Public Utilities Commission in cooperation with California Department of Health Services, September 15, 1989.)

As discussed above, agencies in three of the states which have considered this issue have taken different approaches. Although all three found that an association between adverse health effects and exposure to electric/magnetic fields has not been established, Florida and New York have set (or will soon set) electric and magnetic field limits for the edge of transmission line rights-of-way; California has not.

While both Florida and New York may claim to have taken precautionary measures, the respective standards do not

appear to go much beyond the status quo in those states, nor do the standards appear to have any scientific basis.[4] In this regard, the New York Commission chose not to base its interim magnetic field limit upon any of the findings of the projects funded by the NYSPLP,[5] or of the other studies reported therein. Instead, the New York Commission justified an interim magnetic field standard upon a theory that society (presumably New York residents) has implicitly accepted the risks from electric/magnetic fields associated with 345 kV lines. The New York Commission provides no basis for such a theory.

In my view, the position taken by the California Public Utilities Commission and Department of Health Services is the most forthright. Thus, while it is acknowledged that there is uncertainty on this issue and that continued oversight of new scientific evidence is necessary, I find it inappropriate to set standards for magnetic fields or rights-of-way which have no scientific basis.[6] The view that such actions are pre-

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[4] In fact, the New York Commission acknowledges that "the interim [magnetic field] standard will not be directly related to biological effects . . ." (Order issued April 12, 1988, in Cases 26529, 26559, and 27637, at 7.)

[5] The New York Commission Staff's recommended magnetic field limit of 100 mG is 30 to 50 times higher than the 2 to 3 mG magnetic fields reported by Savitz as possibly associated with an elevated risk of childhood cancer.

[6] Were this Commission to adopt magnetic field limits in the range of those set by Florida or New York (i.e. 100-200 mG), they would have no impact upon the construction or operation of the Brighton-High Ridge line.

mature is further bolstered by the testimony of OPC witness Polk concerning the possibility of "window effects." That is, if biological effects do result from exposure to electric and/or magnetic fields, there may be "windows" in which such effects occur -- while no effects are produced by frequencies above or below that level. Assuming, arguendo, that biological effects are produced within frequency or amplitude windows, it could be irresponsible to require some type of action which might decrease fields such that they would fall within a window in which an effect would occur.

While finding that the evidence in this case is inconclusive, I reject the suggestions of OPC, Howard County, MLF, and Born/Murch to expand the right-of-way of the line, redesign the line configuration, or set a magnetic field limit within homes along the transmission line's route. For the reasons set forth above, it would be arbitrary, and perhaps counterproductive, for this Commission to adopt such recommendations at this time.

I also reject the suggestion that the Brighton-High Ridge line can be rerouted to avoid residences. The purpose of this transmission line is to complete the last 10-mile segment of a 238 mile 500 kV loop around the Washington D.C. metropolitan area. Given the end-point constraints of connecting two 500 kV transmission lines, and the level of development in the area, it would be impossible to construct this line while avoiding residences.

The suggestion that construction of the Brighton-High Ridge line be delayed until scientists resolve the question at issue is likewise unrealistic. Adopting such a recommendation would require placing a similar moratorium on construction of virtually all transmission and distribution lines within the state. Clearly, such a drastic measure cannot be taken without proof that it is necessary.

Although additional restrictions should not be placed upon construction of the Brighton-High Ridge line at this time, I note that numerous research projects on the issue are currently being pursued. Among those conducting such projects are the National Cancer Institute (Tr. at 738-739) and the California Public Utilities Commission in cooperation with the California Department of Health Services. If these or other future studies support a finding of adverse health effects from exposure to the electric/magnetic fields of electric power lines (transmission, distribution, and/or service lines), it will be necessary for this Commission to take appropriate action not only with respect to the Brighton-High Ridge line, but potentially with respect to <u>all</u> lines within the State. At this time, the evidence simply does not support a conclusion which would require such a massive and extraordinary undertaking.

As previously indicated, DNR/Staff recommend that PEPCO be allowed to proceed with construction of the Brighton-High Ridge line while the Commission continues to monitor new scientific evidence on the issue of health effects from expo-

sure to electric power lines. Having considered the evidence presented in this matter, as well as the options available to the Commission, I accept the recommendation of DNR/Staff.

As a final observation, it is recommended that the Commission participate in efforts by other states, the federal government, or organizations such as the National Association of Regulatory Utility Commissioners to sponsor additional research on this issue.

IT IS THEREFORE, this 21st day of December in the year Nineteen Hundred and Eighty-nine,

ORDERED: (1) That the Public Service Commission Staff shall monitor future reports of scientific evidence concerning possible adverse health effects from exposure to the electric and/or magnetic fields produced by electric power lines. The Staff shall make a semi-annual report to the Commission, beginning July 1, 1990, on any significant scientific evidence on this issue. In both endeavors, Staff should seek the assistance of the Department of Natural Resources.

(2) That any change to the Certificate of Public Convenience and Necessity issued to the Potomac Electric Power Company for construction and operation of the Brighton-High Ridge transmission line is not warranted.

(3) That this Proposed Order of Hearing Examiner will become a final order of the Commission on January 23, 1990, unless before that date an appeal is noted

with the Commission by any party to this proceeding as provided in Section 20(c) of The Public Service Commission Law, or the Commission modifies or reverses the Proposed Order or initiates further proceedings in this matter as provided in Section 86(d) of The Public Service Commission Law.

Teresa M. Bay

Teresa M. Bay
Hearing Examiner
Public Service Commission of Maryland

APPENDIX A

## Intervenors Appearing Pro Se

Ms. Lauren Church

Ms. Marcia Kearly

Mr. George McCollam

Ms. Anna Williams

Mr. Daniel Ives

Mr. Michael Vega

Mr. James R. Buch

Mr. Robert M. Murch

Mr. John J. Hanlon

Mr. Roscoe C. and Ms. Dorothy J. Born

of current management, the Court finds that argument to be disingenuous. The REA's motion to examine management about the transfer was filed on June 14, 1990 and granted on July 20, 1990. An article on the issue was in the newspaper shortly thereafter. It is difficult for the Court to imagine that CFC only recently learned of the transfer and if the transfer did deeply concern CFC, why it was not mentioned in the exhaustive testimony of its witness which was filed on July 13, 1990.

[15]On the other hand, it appears that PSCo filed its support of the motion in fulfillment of its warning that it would do so if Colorado-Ute did not accept its subject offer. The Court does not countenance the tactical use of a motion as significant as a motion to appoint a trustee as retribution for the debtor's failure to carry out a particular creditor's demands.

[16]The trustee may need to hire out-of-state counsel due to the current involvement in this case of most of the local bankruptcy firms with the staff and ability to represent the trustee.

## Re Jersey Central Power and Light Company

Docket No. EE89020154

New Jersey Board of Public Utilities
July 12, 1990

ORDER declining to rehear a decision authorizing construction of a 230-kilovolt electric transmission line, despite recent questions as to health hazards associated with concomitant electromagnetic fields.

1. PROCEDURE, § 32 — Rehearing — Board authority — Limits.

[N.J.] The board may extend, revoke, modify, or order rehearing of any of its decisions at any time, limited only by considerations of reasonableness and equity and a need for the parties involved to have a sense of finality about board proceedings.
p. 546.

2. PROCEDURE, § 32 — Rehearing — Timing — Prior opportunity to intervene as a factor.

[N.J.] Where a municipality had had adequate notice of an electric utility's plan to construct a high-voltage transmission line, but neither commented nor intervened in the certificate proceeding, the city's petition to rehear the decision authorizing construction of the line was denied, as the petition was not filed until the line was almost complete and ready to be energized.
p. 546.

3. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Notice requirements.

[N.J.] Where an electric utility had provided adequate public notice of its intent, routing, and sizing for construction of a proposed high-voltage transmission line, it was found unnecessary for the utility also to be required to provide separate notice of specific health issues that might arise in association with electromagnetic fields surrounding the line.
p. 546.

4. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Electromagnetic fields — Health hazards.

[N.J.] Finding a continuing division of scientific opinion as to the health hazards presented by electromagnetic fields surrounding high-voltage electric transmission lines, the board declined to stay a decision authorizing construction of a transmission line, as the line was almost complete anyway, a need for the line's capacity had been demonstrated, and no present danger from the line was conclusively proven to exist.
p. 546.

5. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Electromagnetic fields — Guidelines.

[N.J.] The state of New Jersey has only guidelines for acceptable levels of electromagnetic radiation emissions from high-voltage electric transmission lines, but no formal, enforceable regulations on electromagnetic fields.
p. 547.

i. ELECTRICITY, § 7 — Authorization for transmission [illegible] lines — Factors — Electromagnetic fields — "Prudent avoidance" standard.

[N.J.] Discussion of (1) the possibility of health hazards associated with electromagnetic fields surrounding high-voltage electric transmission lines, (2) the "California" approach to such hazards, which does not find electromagnetic field health hazards irrefutable, and (3) the "Colorado" approach, which relies on "prudent avoidance" of certain levels of radiation just in case health hazards are proven in the future; the board stated that it was likely to consider adoption of the "prudent avoidance" standard in the future as a matter of transmission line construction policy. p. 549.

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APPEARANCES: Wilentz, Goldman & Spitzer, by Sidney D. Weiss, Esq., Woodbridge, New Jersey, for Jersey Central Power & Light Company; Dasti & Murphy, by Jerry J. Dasti, Esq., Forked River, New Jersey, for the Township of Berkeley; John C. Sahradnik, Esq., Toms River, New Jersey, for the County of Ocean.

Before Weiner, President, and Barbour, commissioner.

By the BOARD:

On February 8, 1989, Jersey Central Power & Light Company (JCP&L or Company) filed a petition pursuant to *N.J.S.A.* 40:55D-19 requesting an order that the zoning ordinances and land use regulations of the Township of Berkeley (Berkeley) and the Borough of South Toms River, both in Ocean County (County), shall not apply to, among other things, the construction and operation of a 3.14 mile 230 KV line, together with supporting and appurtenant structures, beginning at a tap point on the Company's previously approved Whiting/Van Hiseville 230 KV line in Berkeley and from there continuing through Berkeley and the Borough of South Toms River to the JCP&L Manitou substation in Berkeley.[1]

A copy of the petition was served upon both of the affected municipalities. Neither of the municipalities filed an answer or appearance and it was determined that the matter could proceed as an uncontested case. Thereafter, following notice to both municipalities of the date and time, a hearing was held on March 30, 1989. No one appeared from either municipality to object to the relief being sought by JCP&L in this proceeding.

At hearing, JCP&L introduced and relied upon the testimony of five witnesses: (1) Edward R. Klasek, System Planning Engineer, testified concerning the need for the subject transmission line and concluded that the proposed construction would provide the required capacity increase for the area's 34,500 volt network, would provide more reliable service by maintaining adequate area 230,000 volt network supply voltage under the double circuit tower outages conditions, and would provide a margin of reserve capacity on the system to serve continuing load development in the area; (2) John J. O'Brien, Manager of Transmission Design, testified as to the route of the line, the type of structures to be installed, the construction techniques to be utilized and other particulars regarding the project. He further testified that calculations made to determine electric field strength at the edge of the right-of-way indicated that the maximum electric field strength would be well below the existing guidelines established by the New Jersey Department of Environmental Protection; (3) John J. Courtot, Manager of Substation Engineering, testified with regard to the work needed to expand the Manitou substation; (4) John J. Higgins, a Planning Consultant, testified concerning requirements of the land use regulations of the affected municipalities; and (5) Frederick J. Palmer, a Real Estate Consultant, testified that the project could be constructed and placed into operation with no substantial detriment to either the public good or to neighborhood property values.

After review of the entire record, the Board, in a Decision and Order dated June 7, 1989, determined that the proposed transmis-

sion line and substation addition were necessary for the service, convenience and welfare of the public. The Board therefore ordered that neither *N.J.S.A.* 40:55D-1, *et seq.*, nor any municipal ordinances or regulations made under authority thereof would apply to the subject project.[2]

By letter dated January 9, 1990, Berkeley, through its counsel, for the first time opposed the line on the grounds that its proximity to two senior citizen communities and the potential health hazards associated with power transmission lines were issues "probably not brought before the Board." Berkeley asked the Board to order JCP&L to cease construction of the line until such issues could be addressed.

By responding letter dated January 22, 1990, JCP&L notified the Board that the $3.6 million line had been virtually completed and would be energized within a matter of days. The Company indicated that it had met with the Berkeley administrator on January 25, 1989 and discussed the project prior to the filing of the Company's petition in this matter. The Company also provided the Board with a copy of a widely distributed memorandum from the administrator dated January 30, 1989, indicating that the route, of the proposed line was known to the Township. The Company's letter of January 22, 1990 goes on to state that Berkeley had been given prompt notice of all events occurring with regard to this matter and that no objection had been raised.

By letter also dated January 22, 1990, Berkeley argued that it had never received notice from JCP&L concerning potential health problems associated with electromagnetic fields emanating from high voltage electric transmission lines. The Township's primary concerns were related to cancer and to possible effects on cardiac pacemakers.

On January 23, 1990, Berkeley filed a formal motion with the Board requesting: (1) the reopening, rehearing, reargument and reconsideration of this matter pursuant to *N.J.S.A.* 48:2-40, *N.J.A.C.* 14:1-13.1, *et seq.* and 14:1-14.1, *et seq.* and (2) a stay of the Board's June 7, 1989 Order. Said motion was subsequently joined in by Ocean County and both movants requested oral argument.[3] By letter dated February 14, 1990, the Acting Public Advocate supported the motion and indicated that if said motion were to be granted, the Advocate would move to intervene.

By supplemental filing dated January 25, 1990, Berkeley supported its request for a cease and desist order by arguing that: (1) currently pending state and Federal legislation with respect to the effects of electromagnetic fields and public interest mandates a reconsideration of the Board's decision and (2) by agreeing to delay construction of its Aberdeen-Red Bank 230 KV line (Monmouth County) (Docket No. EE8812-1293), JCP&L has indicated that it is not certain of potential health consequences associated with the transmission line. Berkeley further stated that along with two citizens, it had filed a complaint in Superior Court seeking to permanently enjoin JCP&L from constructing and operating the line. *Mayor and Council of the Township of Berkeley, et al, v. Jersey Central Power & Light Company*, Superior Court of New Jersey, Chancery Div., Ocean County, Docket No. C-38-90[4].

The formal positions of the parties were set forth in various moving and responding papers and were further developed and supplemented during the course of oral argument before the Board.

In support of their motion, Berkeley and Ocean County argue that JCP&L was aware of the scientific studies conducted with regard to the health impacts associated with exposure to high voltage electric transmission lines and failed to disclose their existence to the Township and its residents. They further argue that said failure constitutes good cause for the reopening and reconsideration of the prior proceedings held before the Board.

It is the position of movants that, had the existence of such information been disclosed, concerns of local residents would have been expressed at the public hearing and further evidentiary hearings would have been requested. Accordingly, they contend that the notice provided by JCP&L was not adequate to protect the due process rights of the residents and that the potential negative impact on the health, safety and welfare of the public represents a substantial basis for the reopening and reconsideration of the Board's prior proceeding and

order.

Movants do not dispute that JCP&L had complied with the notification requirements set forth in *N.J.S.A.* 40:55D-19. Said statute provides in pertinent part:

> This act or any ordinance or regulation made under authority thereof, shall not apply to a development proposed by a public utility for installation in more than one municipality for the furnishing of service, if upon a petition of the public utility, the Board of Public Utility Commissioners shall after hearing, *of which any municipalities affected shall have notice*, decide the proposed installation of the development in question is reasonably necessary for the service, convenience or welfare of the public. (Emphasis added).

Rather, the gist of movants' argument is that JCP&L had an obligation to give specific notice of the controversy surrounding possible health hazards caused by electromagnetic fields. As stated by the County at pages 8-9 of its brief:

> . . . considering the sensitive nature of the issues in question (i.e., the potential health hazards posed to nearby residents by prolonged exposure to high voltage electric transmission lines), JCP&L should have gone further and disclosed to nearby residents the health issues posed by the construction of the Project, including JCP&L's knowledge of the existence of several studies linking human exposure to high voltage electric transmission lines with cancer and other serious adverse health effects.

Movants also argue that as electric service is currently provided in the Berkeley area, the subject line should not be energized until evidentiary hearings can be held to look into: (1) the adverse health impact alleged by movants as a result of electromagnetic fields emanating from high voltage transmission lines; and (2) those measures that could be implemented to reduce exposures to such fields. When asked by the Board at oral argument whether granting of the relief requested would require Board reevaluation of all similar transmission facilities, counsel for movants responded that such broad reevaluation might be required if the Board were to find adverse health effects to be associated with such transmission facilities (Transcript of oral argument, April 4, 1990, p. 32).

Movants further contend that they are entitled to emergent relief in the form of a stay of the Board's Order of June 7, 1989, thereby prohibiting JCP&L from placing the subject 230 KV Manitou-Whiting line in service.[5]

Movants have likened the criteria for obtaining such a stay to that necessary for the issuance of a preliminary injunction, the main purpose of which would be to allow deliberation and consideration of a case on its merits while maintaining the *status quo*.[6]

The arguments of JCP&L in opposition to the pending motion are as follows:

1. Notice provided to Berkeley exceeded the statutory requirement as set out in *N.J.S.A.* 40:55D-19 by informing Berkeley of the petitions to be subsequently filed with the Board and the Pinelands Commission. In addition, the Company met with Berkeley officials and provided them with detailed information, such as maps and drawings. Thus, proper notice, full disclosure of the subject matter, and ample opportunity to participate was provided to Berkeley. With regard to Berkeley's contention that JCP&L was obligated to notify Berkeley of possible health hazards, the Company argues that there is no legal authority for the proposition that a notice given pursuant to *N.J.S.A.* 40:55D-19 must include a disclosure of all potential issues that could be explored at a hearing regarding a utility installation;

2. Berkeley and Ocean County have no standing to bring the pending motion since they never entered appearances or participated as parties as required by *N.J.A.C.* 14:1-14.1(a).[7] Even if they had been parties, the Company argues that the motion should be barred as untimely;

3. Neither Berkeley nor Ocean County has offered any basis for the Board, on its own motion, to reopen the hearings. JCP&L argues that the movants have conceded that no relevant study establishes that electromagnetic fields cause hazardous health effects and that, if there

were to be a rehearing, the best case that could be made would be to suggest that adverse health effects may occur. Such speculation, according to JCP&L, would be insufficient to justify any change in the Board's prior approval. The Company further argues that the studies relied on by movants support neither the consideration of the development of specific field strength standards nor the adoption of a plan of "prudent avoidance" with regard to a line that has already been built. In addition, the Company noted that if a real, as opposed to a speculative, threat of harm were shown to exist with regard to electromagnetic fields, not only might the Board be required to reevaluate all similar facilities, but society as a whole would also have to evaluate a host of more commonplace sources of electromagnetic fields, e.g. household wiring and appliances (Transcript of oral argument, April 4, 1990, pp. 50, 56);

4. The movants' request for emergent relief should be denied as they have made no showing of irreparable harm, and have not established any proven health risk including any adverse affect on health sustaining equipment such as cardiac pacemakers;

5. The subject line has been approved by the Board and constructed in reliance upon that approval; and

6. Said line is not unique and is substantially the same as tens of thousands of miles of electric transmission lines located throughout the United States.

The issue of standing would appear to present a threshold question as to whether Berkeley and Ocean County may bring the instant motion. The Board is of the opinion, however, that this question need not be addressed.

[1] There can be no doubt that the Board has the authority, pursuant to *N.J.S.A.* 48:2-40 and *N.J.A.C.* 14:1-14.1(b), to order rehearing, reargument or reconsideration and to extend, revoke or modify a decision or order made by it, on its own motion, at any time. *Township of Deptford v. Woodbury Terrace Sewerage Corp.*, 54 N.J. 418, 255 A.2d 737 (1969). The exercise of such authority must, however, be tempered by considerations of fairness and reasonableness, including considerations as to timeliness. *N.J. Bell Tel. Co. v. Board of Public Utility Commissioners*, 12 N.J. 568 (1953); *Ruvoldt v. Nolan* 63 N.J. 171 (1973); *In re Trantino Parole Application*, 89 N.J. 347 (1982); *Matter of Hotel and Restaurant Employees and Bartenders*, 603 N.J.Super. 297 (App. Div. 1985). In addition, the Board is cognizant of the need for certainty and finality in connection with administrative decisions and orders. It is equally important, however, that such considerations not deprive the public of a forum in cases involving weighty and pressing public policy issues. We regard this matter to be such a case.

Therefore, the Board on its own motion, pursuant to *N.J.S.A.* 48:2-40 and *N.J.A.C.* 14:1-14.1(b), will consider the motion of Berkeley and Ocean County. Accordingly, there will be no need to further address any issues pertaining to standing, including the applicability, if any, of the Environmental Rights Act, *N.J.S.A.* 2A:35A-1, *et seq.* The Board further finds that its decision to consider, on its own motion, the pending motion will similarly render a ruling on the adequacy of notice unnecessary at this time.[8]

[2-4] The ultimate question to be addressed by the Board, therefore, is whether a substantial basis has been established to warrant the reopening and reconsideration of the Board's Decision and Order of June 7, 1989. If so, the Board must also address whether the scope of the proceeding would be limited solely to a review of the Manitou-Whiting 230 KV transmission line or expanded to allow a review of all transmission lines in New Jersey which are similar to the subject line in terms of capacity and purpose. After careful review and consideration of the record, however, including the extensive submissions of the parties related to the pending motion, the Board concludes that a reopening of this matter is not warranted.

The underlying argument of the movants is that electric and magnetic fields produced by high voltage electric transmission lines are a potential threat to the public health. However, movants do not seriously dispute that there is no conclusive proof that such fields, in fact, cause hazardous health effects. Indeed, all reports cited by the parties, such as those prepared by

the Office of Technology Assessment for the House Interior Subcommittee on Water and Power Resources (June 1989) and the California Public Utilities Commission (September 15, 1989), acknowledge the inconclusive nature of current research in the area of electromagnetic fields. For example, in its report to the California Legislature, the California Commission recommended that:

> California take no action at the present to regulate electric and magnetic fields around electric power facilities. Any such actions are premature given current scientific understanding of this public health issue. Too little is known presently to be able to determine where or what rules would provide useful protection. Existing research data are not sufficient for adequate accurate risk assessment. We do not know which components, if any, of electric power utility operations pose significant health hazards. Although biological effects are clearly established, the relationship of these effects to possible public health risks is not yet established.

Similarly, on July 1, 1987, the report of the Scientific Advisory Panel of the New York State Power Lines Project was submitted to the New York Public Service Commission. After concluding that its findings did not readily translate into concrete regulatory recommendations on width of right-of-way, line heights, or location of lines near homes, the Panel recommended further research in specific areas, administered ". . . by an agency, preferably federal, which is credible by virtue of being clearly independent of partisan influence."

The continuing uncertainties with respect to electromagnetic fields were further underscored in connection with the recent siting and construction of a transmission line in the State of Oregon. The Energy Facility Siting Council in Oregon asked the State Department of Energy to review new information on the human health effects from 60 Hertz electromagnetic fields from high voltage transmission lines. The Energy Department contracted a team of researchers from various fields to review the issue. The report, dated January 1990, and written by Energy Department staff, summarizes the individual comments of the Panel members. A review of those comments reveals the inability of the individual panel members to reach any definitive conclusions regarding potential health effects associated with electromagnetic fields. The only unanimous conclusion reached by the Panel as noted by the Energy Department staff in its report, was that ". . . uncertainties point to the crucial need for further research."

[5] The conclusions reached in the above cited scientific studies are consistent with information transmitted to this Board by the New Jersey Department of Environmental Protection (DEP) prior to the Board's June 7, 1989 Decision and Order in this docket. In response to a Board inquiry regarding the potential health effects of electromagnetic radiation emanating from high voltage transmission lines, former DEP Commissioner Christopher J. Daggett, by letter dated April 11, 1989, advised the Board that:

> At the present time, the Department of Environmental Protection does not have regulations governing exposure to electromagnetic radiation emissions from power lines. The Commission on Radiation Protection has, however, passed a resolution . . . which states that the electric field at the edge of the right-of-way of such transmission lines should be no higher than 3 kilovolts/meter. This is a guideline and is not, therefore, enforceable. To the best of our knowledge all transmission lines meet this guideline.
>
> The Commission on Radiation Protection is appointed by the Governor and is responsible for promulgating rules and regulations concerning radiation protection in New Jersey. The Commission has not amended its resolution regarding electric fields to include the magnetic fields associated with power lines because they feel that there is insufficient scientific evidence, at this time, to warrant issuing guidance or promulgating regulations.
>
> In the absence of specific regulations we would normally turn to the scientific research

community for advice and counsel. Here we find that, on this issue, knowledgeable opinion is divided. While many researchers have reported biological effects of electromagnetic radiation, no study has demonstrated statistically significant adverse health effects.

While this is a very active area of research involving the scientific community, the utilities and various regulatory bodies, we do not anticipate the publication of definitive results for at least several years.[9]

Recent case law dealing with electromagnetic fields provides no more support for movants' position than do the above cited scientific studies. The Colorado Public Service Commission, by Order dated December 20, 1989, approved an application of Public Service Company of Colorado to upgrade an existing 115 KV transmission line to 230 KV. In deciding this matter, which was the first in which health effects issues had been specifically raised by the parties in connection with a power project in that state, the Commission found:

> As a result of the evidence presented in the docket on health effects, we arrive at a summary finding that, as of this time, there are no known or apparent adverse health effects resulting from electric and magnetic fields from low level overhead power transmission lines. *In the Matter of Public Service Company of Colorado to have Upgrades in Douglas County,* Docket No. 89A-028E, at page 16.

In an opinion dated December 21, 1989, a hearing officer for the Public Service Commission of Maryland, after analysis of extensive medical testimony, recommended approval of a 500 KV transmission line. In doing so, she specifically found that a causal relationship had not been established between exposure to electromagnetic fields and adverse health effects and saw no reason why the line should not be built:

> The suggestion that construction of the line be delayed until scientists resolve the question at issue is likewise unrealistic. Adopting such a recommendation would require placing a similar moratorium on construction of virtually all transmission and distribution lines within the state. Clearly, such a drastic measure cannot be taken without proof that it is necessary. *In the Matter of the Application of Potomac Electric Power Company,* Case No. 7004, at page 82.

The Maryland Commission, by order dated May 1, 1990, adopted *in toto* the hearing officer's recommendations.

In *Zappavingra v. State of New York and Power Authority of New York,* New York Court of Claims, Claim No. 74085, September 27, 1989, the claimant, in an action seeking condemnation damages, modified his original application by withdrawing his allegation that electromagnetic fields in fact cause health hazards. Rather, he argued in his post-trial brief that "... based upon the present state of science and the attendant publicity emanating through the motion . . . buyers have 'fear' of health risks associated with these high voltage power lines." In rejecting the claim, the court stated at page 25:

> After reviewing all of the scientific testimony and the numerous reports, the court finds that claimant failed to sustain his burden of preponderating in the evidence on the issue that there is a reasonable basis for any fear that power lines cause health problems.
>
> This Board takes very seriously its authority to require all public utilities to furnish safe, adequate and proper service. We have therefore carefully reviewed the scientific studies submitted to us and the case law cited by the parties. Were a present and known danger to the public shown to exist, this Board would not hesitate to take prompt remedial action. On the record before us, however, no known danger has been shown to exist. At most, the record reveals a degree of potential risk which cannot be quantified with any certainty.
>
> There can be no doubt that society tolerates certain degrees of risk, including, but certainly not limited to: airplane and motor vehicle

travel; emission of certain pollutants into the air and water; treatment of food products with chemicals; and unavoidable side effects associated with the development of prescription drugs and other medical treatments. However, in tolerating these risks, society has, based upon existing knowledge, set standards beyond which the activity will pose a clear and unacceptable risk to human health and, therefore, should be restricted. In setting such standards, the crucial determination is the point at which the identifiable risk rises to a level which imposes upon society the duty to take protective action, notwithstanding possible inconvenience and disruption to normal daily life.

If there were in the record before us a demonstrated, immediate and quantifiable health risk our course of action would be clear: the Manitou-Whiting 230 KV transmission line would not be energized until all concerns had been adequately addressed. Moreover, if such a health hazard were shown to exist, we would very quickly initiate an evaluation of all similar transmission lines in the State.

However, as has been the case in those jurisdictions wherein extensive studies have been conducted, and/or contested proceedings held, there is nothing before this Board that demonstrates any quantifiable risks associated with electromagnetic fields emanating from high voltage electric transmission lines. The record further reflects, and the Board must so find, that the subject line meets the New Jersey guideline pertaining to electric fields. As previously noted in Commissioner Daggett's letter of April 11, 1989, the guideline for electric field strength at the edge of an electric transmission line right-of-way has been set at 3 kilovolt/meter by the Commission on Radiation Protection. With regard to the subject line, it has been established that the maximum electric field which will be attained directly under the line, has been computed to be 0.355 kilovolt/meter in the areas of the affected senior citizen communities. This electric field will be approximately six to seven times lower than those fields which affect the most sensitive documented cardiac pacemakers. Similarly, the maximum magnetic field to be produced in this area will be 1.4 milligauss, far below the level of 1,500 milligauss which represents the lowest documented field level that has affected pacemaker function. Accordingly, the Board must further find that the subject line poses no greater threat to public health than does any 230 KV line in the State.

In light of the lack of any showing in this proceeding of adverse health effects and in recognition of our prior findings regarding the need for this project, the Board can only conclude that there is no basis in the record for denying JCP&L the authority to energize the Manitou-Whiting 230 KV transmission line.

[1] In the absence of any definitive proof regarding adverse health effects, the Board has two options. We may either: (1) conclude, as did the California Commission, that there is not yet enough evidence to warrant any action and, therefore, not require any changes to the present procedures until results of ongoing and future research clearly indicate the presence and extent of any adverse health effects associated with high voltage electric transmission lines; or (2) conclude that there is some basis for concern and consider the adoption of a policy of "prudent avoidance" which has been defined by the Colorado Commission as ". . . the striking of a reasonable balance between avoiding potential harm and the attendant costs and risks." *In the Matter of Public Service Company of Colorado, supra.* at p. 17.

With regard to the implementation of the policy of "prudent avoidance", the Department of Engineering and Public Policy of Carnegie Mellon University has stated:

> ". . . suppose an individual or a regulator is concerned, thinks the evidence points toward the possibility of some risk, and feels that something should be done. In this case, they can try to exercise some prudence by keeping people out of fields when this can be done with modest amounts of money and trouble. However, in circumstances where the cost and problems associated with doing anything would be large, these people would argue that the prudent thing to do is wait until better information is available.

"Electric and Magnetic Fields from 60 Hertz

Electric Power: What do we know about possible health risks? (1989)", pp. 25-26.

The policy of "prudent avoidance" was actually implemented in the aforementioned Colorado decision. Therein, the Colorado Commission stated that ". . . steps to reduce exposure at reasonable or modest cost . . . would include the use of reverse phasing on the line, higher ground clearances, and larger conductors than otherwise necessary . . . .". *In the Matter of Public Service Company of Colorado, supra,* at p. 17. In approving the request to upgrade the system, the Commission also noted that:

> Public Service has agreed to forego an interim 115/230 KV configuration and construct a 230/230 KV configuration as well as using steel poles in lieu of lattice towers. Public Service has also indicated that the ground clearance for the upgraded line is more than required by National Electric Code requirements of the line and that it will also use larger conductors than necessary. These proposals by Public Service will lower fields significantly, reduce noise, and thereby constitute a reasonable implementation of prudent avoidance. *Id.*

The Colorado Commission also directed the company to examine the possibility of locating its poles at a greater distance from residential properties. The Commission further held that "prudent avoidance" meant that the company ". . . should quantify and continue its support of industry research in this area and should begin to develop in-house capability to survey and measure electromagnetic fields." *Id.*

With regard to "prudent avoidance", there appears to be a consensus that such policy should be limited to matters involving the construction of new facilities or the proposed upgrading of an existing line, as was the case in the matter before the Colorado Commission. A clear statement of this position appears in the aforementioned publication of Carnegie Mellon University at page 27:

> State regulators who wish to exercise prudence about the exposures that people receive from power lines should, until more is known, limit their concern to new facilities. This is because even under the most pessimistic assumptions it is hard to justify the costs of modifying old facilities. Regulators who want to exercise prudence should site new facilities so as to keep people out of fields, but only up to some practical limit. Spending amounts as high as a few thousand dollars to avoid exposing someone might be justified. Much larger expenditures can almost certainly not be justified.

The Board may well have an opportunity to consider the application of "prudent avoidance" to new construction within the context of the pending contested matter involving JCP&L's proposed 230 KV transmission line project in Monmouth County. *In the Matter of the Jersey Central Power & Light Company Transmission Line Application,* BPU Docket No. EE88121293, OAL Docket No. PUC02022-89.

Based upon the record in this matter, however, the Board can only conclude that the subject line, was substantially constructed as of the date of Berkeley's motion and that said construction was based upon a determination as to the need for the line which was supported by a full record and appropriate findings. That determination remains valid as the need for this line still exists.

Based upon the foregoing and after careful review of the entire record in this matter, the Board *HEREBY ORDERS* that the motion of the Township of Berkeley and Ocean County for the reopening, rehearing, reargument and reconsideration of this matter be and is *DENIED.*

Notwithstanding our conclusions that this line is fully constructed and should be energized, and that the motion of Berkeley and Ocean County should be denied, the Board will provide the parties with a forum in which to explore the potential application of the policy of "prudent avoidance" in the context of a fully constructed and energized transmission facility. Therefore, the Board, on its own motion, will initiate evidentiary hearings, to be held at OAL, to consider such issues with respect to the Manitou-Whiting 230 KV transmission line.

The Board *FURTHER ORDERS* that this

matter, be transmitted to the Office of Administrative Law, on notice to the parties, in order that evidentiary hearings may be held to consider those issues related to the application of the policy of "prudent avoidance" to the Manitou-Whiting 230 KV. transmission line. Prior to said transmittal, the Board, pursuant to *N.J.A.C.* 14:1-11.2 (a), *DIRECTS* its staff to schedule a conference at which the parties may discuss those procedural and substantive issues that will be addressed in this matter.

## FOOTNOTES

[1]The petition further requested Board approval for the expansion of the Company's Manitou substation and its use as a temporary storage yard during construction.

[2]The approvals granted by the Board were specifically conditioned upon the issuance of any necessary approvals from the Pinelands Commission.

[3]Oral argument was heard by the Board on April 4, 1990.

[4]By Order dated January 29, 1990, Judge William H. Huber determined that jurisdiction belonged with the Board and directed that the matter be transferred to the Board pursuant to Rule 1:13-4(a).

[5]Through a number of letters, the last being dated March 28, 1990, JCP&L agreed to defer placing the subject line in commercial operation until April 4, 1990, the date the Board was to hear oral argument on the motion of Berkeley and Ocean County. The Company reserved the right, however, to place the line in operation in the event of an emergency, which was defined as ". . . an outage or contingency event necessitating the temporary use of the line to prevent disruptions or to restore service to customers."

[6]The criteria, as presented by movants, are:

1. No adequate remedy at law;
2. A showing that irreparable injury will result if an injunction is not granted;
3. A showing that there is a reasonable probability of eventual success on the merits of the claim (Movants argue that the importance of this criterion varies, on a case by case basis, with the seriousness of the potential injury to the person seeking the injunction); and
4. A balancing of the relative hardship to the parties in granting or denying the relief.

[7]*N.J.A.C.* 14:1-14.1(a) provides:

A *motion* for rehearing, reargument or reconsideration of a proceeding *may be filed by any party* within 15 days after issuance of a final decision or order by the Board. (Emphasis added).

[8]Pursuant to *N.J.A.C.* 14:1-9.1(a) and *N.J.A.C.* 14:1-9.2(b), the Board granted intervenor status to Berkeley, the two individually named residents of Berkeley and Ocean County at the oral argument held on April 4, 1990.

[9]Senate Bill No. 394 would, among other things, require the Commission on Radiation Protection to: (1) adopt interim rules and regulations, based on a policy of "prudent avoidance", establishing standards for maximum exposure to electric and magnetic fields at the edge of the right-of-way for transmission lines; and (2) in consultation with this Board, the electric utility industry and public interest groups, conduct a survey of the appropriate literature on electromagnetic fields and the potential health implications deriving from human exposure thereto, and to submit a report to the Governor and the New Jersey Legislature. This bill was adopted by the Senate on March 29, 1990, and is now pending in the Energy and Environment Committee of the Assembly.

# Re MCI Telecommunications Corporation

Docket No. TX90050349

New Jersey Board of Public Utilities
May 22, 1990

ORDER directing interexchange telephone carrier to compensate local exchange carriers for intrastate intraLATA calls completed using carrier's services, and initiating investigation into appropriate rate of such compensation.

1. MONOPOLY AND COMPETITION, § 83 — Telecommunications — IntraLATA services — Interexchange carriers.

[N.J.] Because the commission recently had reviewed its policy determinations with respect to the ban on intraLATA telephone competition and had reaffirmed that ban, it

PUBLIC

DEC 27 1989

(Decision No. C89-1622)

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

* * *

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|---|---|---|
| IN THE MATTER OF PUBLIC SERVICE COMPANY OF COLORADO TO HAVE UPGRADES IN DOUGLAS COUNTY. | ) | DOCKET NO. 89A-028E |
| | ) | DECISION OF THE COMMISSION GRANTING APPLICATION SUBJECT TO CONDITIONS |

December 20, 1989

Appearances: Kenneth V. Reif, Esq., Denver, Colorado, Joseph Skinner, Esq., Grand Junction, Colorado, and Thomas Watson, Esq., Washington, D.C., for Public Service Company of Colorado;

Steven H. Denman, Esq., and Karen H. Duwaldt, Denver, Colorado for Douglas County Board of County Commissioners;

Lawrence F. Herbert Pro Se;

William E. Myrick, Esq., Denver, Colorado for William E. Myrick and McArthur Ranch Associates;

James F. Weber Pro Se;

Suzanne Weber Pro Se;

John E. Archibold, Esq., Assistant Solicitor General and Commission Counsel, for the Commission.

STATEMENT

BY THE COMMISSION:

Public Service Company of Colorado (Public Service) filed this application on January 12, 1989, seeking an order from the Commission permitting it to upgrade and provide betterments on an existing 115 KV transmission line located within Douglas County. A procedural history of this docket is appended as Appendix A-1.

The Commission discussed this docket initially at its open meeting on November 2, 1989. This decision is entered on December 13, 1989, and is subject to the provisions of § 40-6-114, C.R.S., and § 40-6-115, C.R.S., concerning reconsideration by the Commission and review by the district court.

## FINDINGS OF FACT

### A. Introduction

Public Service filed this application for the Commission's approval to upgrade an existing 115/115kv transmission line to 115/230kv. The application was filed pursuant to § 30-28-127, C.R.S., which states:

> Public utilities exceptions. None of the provisions of this part 1 shall apply to any existing building, structure, or plant or other equipment owned or used by any public utility. After the adoption of a plan, all extensions, betterments, or additions to buildings, structures, or plant or other equipment of any public utility shall only be made in conformity with such plan, unless, after public hearing first had, the public utilities commission orders that such extensions, betterments, or additions to buildings, structures, or plant or other equipment are reasonable and that such extensions, betterments, or additions may be made even though they conflict with the adopted plan. (emphasis added)

Section 30-28-127, C.R.S., provides that notwithstanding a conflict with the adopted county plan, this Commission may order that public utility extensions, betterments, or additions to buildings, structures, or plant or other equipment are reasonable and that they should be made. The key word in the statute is the word "reasonable" which is not otherwise defined.

Initially Public Service proposed an upgrade of the existing overhead 115/115kv transmission line to an overhead 115/230kv line which runs between the Daniels Park substation in Douglas County and the Greenwood substation in Arapahoe County. During the course of hearings in this docket, Public Service indicated its willingness to upgrade the line from 115/115kv to 230/230kv. The portion of the upgrade involved in this application is within Douglas County. The line was originally installed in 1957 and upgraded to its current configuration in 1971, prior to most development in the area. Public Service filed two applications seeking zoning approvals from Douglas County for a portion of the upgrade. Douglas County, acting through its Board of County Commissioners in a two to one vote, determined that the upgrade was in conflict with its zoning plan and denied Public Service's applications.

Public Service then filed this application with this Commission for approval to construct the upgrade notwithstanding the denials by Douglas County. Douglas County, an intervenor in this application docket, and several other individual intervenors contend that Public Service's application before this Commission for an upgrade should be denied. Alternatively, Douglas County contends that, if this Commission deems that an upgrade of facilities is necessary, the upgraded facilities should be buried. Public Service believes that its application for upgrade should be granted without the additional requirement of burying or undergrounding the line.

After a careful review of the evidence presented in this docket, together with the well-presented positions made available to the Commission by the parties, it is our considered judgment that Public Service's application should be granted subject to certain conditions which are discussed in this decision. We shall now discuss the three phases of this docket which have led us to reach the foregoing conclusion.

B. Phase I - the Need for the Transmission Line Upgrade

Public Service contends that the transmission line upgrade is needed in order to serve the demonstrated need of residents in Douglas County for more electricity. Douglas County countered that the transmission line upgrade is not needed because Public Service load projections are inaccurate and unreliable. We find that the transmission line upgrade, requested by Public Service in its application, is reasonably required for electrical service in the southeast load area generally and in Douglas County in particular. We further find that the transmission line upgrade is the more reasonable proposal vis-a-vis the potential alternative suggested by Dr. Robert H. Sarikas who testified for Douglas County, which was the installation of an adequately sized 230/115kv auto transformer at the Greenwood substation in conjunction with the upgrading of the second Smokey Hill to Leetsdale circuit from 115kv to 230kv.

William J. Martin, Public Service's Vice President, Electric Engineering and Planning, testified to the physical configuration of Public Service's transmission system for providing power to the Denver metropolitan area (including Douglas County) from its metropolitan area power plants and from sources outside of the metropolitan area. Mr. Martin also testified that the demand for power in the southeast load area presently exceeds the ability of the system to supply that power in certain outage situations. Public Service's transmission grid in the Denver Metropolitan area is basically a ring and spoke configuration. Public Service has four power delivery points, namely Cherokee on the north, Lookout on the west, Smoky Hill on the east, and Daniels Park on the south, as depicted in Exhibit A-5. Currently the auto transformer at the Daniels Park substation is loaded to near capacity. In a single contingency outage the auto transformer will be overloaded and insufficient power will flow from Daniels Park to Public Service customers in the southeast load area of the metropolitan area. If the auto transformer capacity is increased, this will result in an

overloading of the existing 115/115kv transmission lines from Daniels Park to Greenwood, in a single contingency outage. Accordingly, these lines must be upgraded to 230/230kv (although operating the line at 115/230kv would be sufficient to carry loads for the next several years to the area).

The Daniels Park to Greenwood transmission line is one of several transmission line "spokes" connected to an outer transmission belt which interconnects the various power importation points around Denver. The spokes were originally built to operate at 115kv. However, it reasonably could have been anticipated that as demand for electricity increased in the Denver metropolitan area additional power would have to be made available, either by building more spokes or increasing the capacity of the existing spokes to 230kv. For the past 20 years Public Service has been upgrading 115kv spokes in Denver to 230kv. The upgrade from Daniels Park to Greenwood is one of many planned upgrades.

Although Douglas County pointed out many discrepancies and problems, we are not persuaded by its attack upon Public Service's load projections. Exhibit A-11 sets forth Public Service's load projections which were made in 1983 for the years 1983 through 1988, and the actual loads that occurred from 1975 through 1988. The total load projected for the southeast load area, depicted on Exhibit A-11, is compared with the actual loads that occurred. It can be seen that the demand for energy in the total southeast load area has been about two percent higher than Public Service's projections even though the Prairie substation, among others involved in this application, was consistently over projected and the projections ignored the 1973 and 1984 figures.

While the growth in the southeast metropolitan area continues to be very high, it is now less than projected in 1983. Douglas County argues that while the allocated coincidental peak loads only slightly exceeded the allocated coincidental peak load projections, the actual non-coincidental substation loads were less than the projections from 1985 through 1988 and the non-coincidental total southeast substation load from 1985 to 1988 was substantially less than the actual allocated coincidental peak load. Thus, Douglas County argues that the comparison demonstrates that the use of allocated coincidental peak load figures (whether actual or projected) inflates the actual loads carried by the southeast substations in the Daniels Park powerline. Douglas County further argues that, since the Commission does not allocate costs in its average and excess demand cost of service study using coincidental peak loads or demand, Public Service's reliance on coincidental peak load studies is misplaced. We do not agree. Coincidental peak load as used in a power flow analysis measures the physical capacity that must be available to avoid power outages or blackouts. Cost of service studies, on the other hand, do not determine what is physically necessary but how the costs of what is physically necessary are going to be allocated. Accordingly, we believe that Douglas County misdirects the focus of this docket by mixing the issue of what is physically necessary in a power flow analysis with the economic issue of how costs are to be allocated in

a cost of service study. This docket does not involve a rate case, but rather whether certain physical facilities should be allowed to be built, notwithstanding a contrary zoning decision of Douglas County.

Although it is likely that the line originally proposed by Public Service was based upon projections, it does not appear that Public Service attempted in this docket to demonstrate the need for the upgraded line merely by presenting future load projections. In fact, by the time Public Service witness Mr. Martin prefiled his direct testimony, actual load figures for the southeast load area were available. These were the figures relied upon by Mr. Martin to demonstrate the need for the upgraded line. He testified that in February 1989 the southeast load area required 576 megawatts. He also testified that had there been a single contingency outage on that peak day, the lights would have gone out. Mr. Martin also indicated that on January 25, 1989, there was a power outage because the actual demand on the system exceeded the ability of the system to supply it. As a result of outages, both Leetsdale to Smokey Hill 230kv transmission lines were out of service. There were only two other sources available to make up for the loss of that power to the southeast load area, mainly the Arapahoe and Daniels Park power sources. The Daniels Park auto transformer became loaded to 133 percent of its capacity; the Arapahoe to Greenwood 115kv transmission line became loaded to 121 percent of its capacity; and the Greenwood to Leetsdale 115kv was loaded to 100 percent of its capacity. Voltages dropped to below normal operating levels. Accordingly, the system was unable to transfer required power through its Daniels Park and Arapahoe substations. Approximately 500,000 people were without power for periods lasting from one minute to an hour and 30 minutes with the average outage being approximately 8 minutes. Had the proposed Daniels Park to Greenwood upgrade been in service, the outage would not have occurred because the upgrade would have more than tripled the capacity of the Daniels Park to Greenwood line. As Mr. Martin pointed out, if the line is upgraded it will have a capacity of approximately 650 megawatts when it is operating at 230/115kv, or 870 megawatts when it is operating at 230/230kv. The 650 megawatts supplied by Daniels Park would have been sufficient to meet the load, even with the outages.

Douglas County contends that Public Service has not adequately studied other alternatives to the transmission line upgrade. Public Service counters that it had studied many alternatives to the upgraded transmission line, including system alternatives which might provide more power to Greenwood and Prairie without upgrading the Daniels Park-Greenwood. These alternatives were not presented in Public Service's case initially. Approximately two dozen alternatives were considered and a brief synopsis of the various alternatives was contained in Public Service's Exhibit A-16. Most of the alternatives were rejected in the early screening process, but four alternatives were seriously studied to a point that cost estimates and power flow analyses were done. As a result of Public Service's study, these alternatives were rejected as well.

On cross examination by Commissioner Lehr, Mr. Martin testified that Public Service had not analyzed the cost or benefit of demand management options as alternatives to the upgrade of the transmission line. Mr. Martin, agreed that such an analysis was possible, that demand reductions could eliminate the need for the upgrade and that such a program of demand reduction should be compared to the supply side option of a transmission upgrade, both on the economics of such an alternative and as to factors external to the economics, such as aesthetics, notice, and exposure to electromagnetic fields. Mr. Martin also stated that he understood that the time had passed in which Public Service could approach this Commission with a supply side alternative in the absence of engineering and financial analysis of demand side options.

Douglas County witness, Robert Sarikas, testified that the installation of an adequately sized 230/115kv auto transformer at the Greenwood substation, in conjunction with the upgrading of the second Smokey Hill to Leetsdale circuit from 115 to 230kv, if necessary, would provide a solution for the overload. Dr. Sarikas was of the opinion that the environmental impact of transformer additions at the existing Greenwood substation, particularly because space is available, would be less than the impact of the transmission line upgrades or construction of additional lines. He stressed that the proposed upgrade of the Daniels Park-Greenwood 115kv line forces resolution of the Arapahoe-Sheridan overloading problem. Since these areas are coterminous in part of the southeast transmission system shown on Exhibit A-6, a resolution of both problems simultaneously, in his opinion, is more desirable than the upgrade.

The alternatives suggested by Dr. Sarikas are essentially variations on the theme of getting power to Greenwood either through Smokey Hill or the Arapahoe power sources rather than through Daniels Park. However, his alternatives fail to deliver sufficient power to the southeast load area and they do not appear to increase the reliability of the system because they fail to relieve the Daniels Park bottleneck. Although Dr. Sarikas says that there is room at the Greenwood substation to upgrade the transformer, it may well be that the Greenwood upgrade, as proposed by Dr. Sarikas, would require the demolition of about seven homes in the area.

We find that in order for Public Service to provide adequate electrical service in that southeast load area, its amended proposal to upgrade its existing overhead 115/115kv transmission line to a 230/230kv transmission line running between the Daniels Park substation in Douglas County in the Greenwood substation in Arapahoe County is reasonable and should be approved.

C. Phase II - Consideration of Non-Need and Non-Health Impacts of Proposed Transmission Line Upgrade

Phase II of this docket was devoted to a consideration of non-need and non-health impacts of the proposed transmission line upgrade. Land use, noise, aesthetics, and property value impacts were considered by the Commission.

1. Land Use Impacts

Douglas County witness Steven Wilson testified that the proposed upgrade should not be approved because of unfavorable impacts upon land use. However, Mr. Wilson's testimony establishes the substantial compliance of the proposed upgrade with the zoning policy and procedure of Douglas County. In fact, the Douglas County planning staff found the Public Service applications in compliance with the county plan. Mr. Wilson's opinion conflicts with the opinion of other members of the planning staff and the documents contained with the file of the planning staff. For example, Exhibit J-5, the memo of July 6, 1988, from Mr. Wilson and Mr. Hainlen to the members of the Douglas County Board of County Commissioners, includes the attachment of the memo of March 16, 1988, finding the application to be in compliance with the Douglas County zoning resolution and indicating that the planning staff's concerns over visual aspects could be dealt with through either coloring the towers or using single steel poles. Finally, the memorandum indicates that the referral agencies to whom the application was submitted had no negative comments.

If we were to accept the notion that adverse land use impacts are a sole basis for our finding that Public Service's proposed power line upgrade was unreasonable, arguably the statute (§ 30-28-127 C.R.S.) that allows review by this Commission from adverse local government land use findings would be nullity. This result follows in logic since this Commission has no land use control jurisdiction and local governments are vested with such powers. If we cannot override a local land use decision affecting utilities, then the statute is meaningless.

2. Aesthetic Impacts

Public Service presented the testimony of Mr. Kim Dreese who presented visual simulations of the proposed upgrade, both with lattice towers and single steel poles. Public Service has agreed to provide either steel lattice towers or single steel poles. We find that the additional visual impacts from the proposed upgrade are minimal. Thus the aesthetics impact aspect of this docket has not been a material factor in our decision. While the natural beauty of the state may someday result in legislative diction regarding undergrounding, we are not willing at this time to require all ratepayers to pay the additional $13.5 million cost based on aesthetics.

3. Property Value Impacts

The Commission is not clothed with power to award damages as a result of property value losses, even if they result from the upgrade. The Commission did rule previously in this docket that the effect of the transmission line upgrade on property values was one of a number of factors that the Commission was entitled to consider in making its determination of whether the upgrade was reasonable. Douglas County witness Mr. Bowes testified that the upgrade will adversely affect property values. Mr. VanCourt for Public Service testified that the upgrade will not affect property values. Mrs. Davis of Greenwood Village said that her land value was lowered significantly when the line running near her house was upgraded from 115kv to 230kv. The transmission line was built in 1957 before most, if not all houses were constructed. There is insufficient evidence on the record to demonstrate that a negative inpact on property values, even in combination with other factors, is so great that the Commission could make a finding that the transmission line upgrade was unreasonable.

4. Noise Impacts

Public Service presented the testimony of David L. Adams on noise. Mr. Adams performed measurements of the transmission lines most similar to that proposed in this docket, both energized and unenergized, and compared those with other measurements taken by Public Service. Based upon his own measurements and his comparison to those of Public Service, and his determination of the noise increase resulting from a wet conductor, Mr. Adams testified that there would be a slight increase in noise, but that the noise would be reasonable. The determination of Mr. Adams that the audible noise from the proposed line is reasonable was supported by his Exhibit F-10, a graph contained in the Electrical Engineers Handbook, 12th Edition, which shows noise complaints arising generally only at levels exceeding that found on lines similar to the proposed upgrade.

Douglas County witness, Michael Summers, testified that Public Service and Mr. Adams should have evaluated the lines under wet conductor conditions and provided an audible noise profile for the proposed 230kv line. Mr. Summers also was of the opinion that Mr. Adams' measurements were good for the single purposes of stating what the noise levels were on the day he performed the test, but his one day test was not sufficient to conclude that noise will not be a problem at the proposed 230kv line. Mr. Summers also criticized Mr. Adams' measurements as being made only during fair weather conditions. Mr. Summers calculated an audible noise profile for the proposed 230kv line under wet conductor conditions which indicated that the upgraded line would reach noise levels of 58.3-53dBAs 5 percent of the time, and noise levels of 49-44dBA 50 percent of the time.

Public Service counters that the noise levels from the proposed upgraded line will be reasonable since the noise levels fall below the maximum noise levels that are permitted in residential areas in

accordance with § 25-12-103, C.R.S. It should also be noted that Public Service has agreed to construct the transmission line upgrade with a larger conductor than it has previously used on similar upgrades. A larger conductor, as a general rule, will operate more quietly than a smaller conductor. Douglas County is apparently of the view that noise in excess of the statutory limits is a public nuisance. It also argues that what is defined as a statutory public nuisance is not the standard governing the need for the construction of electric transmission lines or whether construction is "reasonable." Accordingly, according to Douglas County, it would be unreasonable to use public nuisance standards to define "reasonable" in this docket as far as noise is concerned.

Based on the record in this docket, we find that the increase in noise levels which is likely to be occasioned by the transmission line upgrade is reasonable under the circumstances.

5. Summary of Phase II Impacts

Based upon the foregoing, we conclude that the Phase II impacts, including land use aesthetics, property values, and noise, either singly or in combination, do not adversely affect the overall reasonableness of the transmission line upgrade.

D. Phase III - The Health Impacts

In recent years recognition and concern over the possible adverse health effects of power frequency electric and magnetic fields have increased. This is the first docket at this Commission in which a health effects issue has been specifically raised by the parties in connection with a power project. It was the Phase III health impact issue that garnered the most testimony of the parties and public witnesses who testified in this docket. Many of the public witnesses who testified at the public hearings made known to the Commission their concerns about the possible adverse effects of electric and magnetic fields emanating from overhead power lines. Three individuals were concerned enough about this issue to intervene as pro se parties in this docket and to testify and present exhibits to the Commission. The pro se intervenors, specifically Mr. Herbert and Mr. and Mrs. Weber, in this docket materially assisted the Commission in its overall determination with regard to the health effects issue. Their participation was highly commendable, and is appreciated by this Commission.

Public Service sponsored the testimony of three recognized medical experts. Dr. Darwin R. Labarthe is a medical doctor, researcher in epidemiology and teacher employed by the School of Public Health at the University of Texas Health Science Center in Houston, Texas and also by the Baylor College of Medicine. Dr. Labarthe's other qualifications as an expert are set forth in Appendix B-1.

Dr. Labarthe testified as to the development of epidemiology as a science and the methodologies of the various epidemiological studies in which he and others have been involved described in Appendix B-1. In

explaining what epidemiologists look for in assessing groups of studies for a relationship of a purported agent to a disease, Dr. Labarthe testified that epidemiologists consider several factors with respect to such relationship, including strength, consistency, specificity, time relationship, and coherence. Dr. Labarthe further testified about his review of the epidemiological studies involving power frequency, electric, and magnetic fields in human health.

One of the studies about which Dr. Labarthe testified was a study by Wertheimer and Leeper (1979) in Denver which reported results of a comparison of cancer cases and controls in relation to high and low current wiring configuration codes. Dr. Labarthe stated that in addition to numerous problems in the design, conduct, and analysis of this study, later follow-up studies have not been able to replicate the results of the Wertheimer and Leeper childhood study of 1979. Some of the problems in the Wertheimer and Leeper study included the method of statistical analyses, problems with the experimental design, and problems with the measure of exposure. As an example, a fundamental problem with the Wertheimer and Leeper study, according to Dr. Labarthe, was that it was not a blind study. A blind study is one in which the investigator evaluating exposure does not have advance knowledge of the health status of the individual subjects for whom the measurements are being made, and thus a blind study would limit the chance for bias or error in coding exposure data. Dr. Labarthe also related that a study by Fulton in 1980 attempted to replicate the findings of the Wertheimer and Leeper study concerning childhood leukemia but that the conclusions of the Fulton study were in conflict with those of Wertheimer and Leeper in that no relationship was found between childhood leukemia and wiring configuration codes.

Dr. Labarthe also discussed the Savitz studies (1986, 1988) which looked at several disease categories, two different types of control groups, four measures of exposure, and differing numbers of stratification of exposure in data. The Savitz study had over 1,500 calculations which showed no significant associations between cancer and magnetic fields when the actual measurements of magnetic field exposure were used. According to Dr. Labarthe, the only times Savitz identified any significant association was when wiring configuration codes, an estimate of exposure for a particular residence, were used. According to Dr. Labarthe, the Savitz study consistently found no statistically significant associations between cancer and magnetic fields and only a few irregular statistically significant association between cancer and wiring configuration codes. With respect to childhood cancer studies taken as a whole, and the degree of validity of individual studies within that group, Dr. Labarthe concluded that there is no consistent pattern of increased risk across or within the studies, that no studies have established a dose-response relationship between any type of childhood cancer and any measure of exposure, and that there is no increased risk of childhood cancer when actual electric or magnetic fields were measured. Dr. Labarthe also discussed several other studies (e.g., Milham (1982, 1985, 1988), Coleman (1983, 1985, 1988), McDowall

(1983, 1986), Stevens (1988), and Stearn (1986)) which have not shown any consistent patterns of risk that would provide a scientific basis for concluding that electric and magnetic fields are associated with cancer.

Finally, Dr. Labarthe testified as to certain other epidemiologic studies concerned with power frequency fields and other health indicators, other than cancer. He discussed the Perry (1981) study on suicide, the Singewald (1973) study of electric utility linemen, and the Strumza (1970) study of individuals living in the vicinity of electric transmission lines. Dr. Labarthe affirmatively answered the specific question of whether sufficient research had been conducted in his area of expertise, namely epidemiology, for him to reach a professional opinion concerning the power frequency electric and magnetic fields and human health. Dr. Labarthe's opinion was as follows:

> Taken together, the epidemiologic studies on power frequency electric and/or magnetic fields do not show that exposure is associated with cancer or any other adverse health effects. The group of epidemiologic studies concerning power frequency electric and magnetic fields and human health have examined a variety of health end points including childhood and adult cancer and overall use of medical facilities and/or prescription medicines. The studies vary widely in their strengths and weaknesses, i.e., in their validity. The studies indicate that, regardless of how it is measured, increased exposure to power frequency fields is not associated with increased risk of any disease or illness, i.e., there is no dose-response relationship, no consistent pattern of increased risk of disease or illness associated with field exposure either within or across studies. There is neither specificity of disease or illness nor a time relationship of exposure and disease or illness that indicates a cause-effect relationship. Further, indications from related fields of science provide no persuasive pattern of any adverse health affects from exposure to power frequency electric and/or magnetic fields.

Dr. Edward Paul Gelmann, Chief of the Division of Medical Oncology and Professor of Medicine and Professor of Anatomy and Cell Biology at the Georgetown University School of Medicine also testified on behalf of Public Service. Dr. Gelmann is a specialist in medical oncology and cell biology. Dr. Gelmann's other qualifications as an expert are set forth in Appendix D-2.

Dr. Gelmann was asked to conduct an independent literature search and independently examine the relevant scientific studies in the fields of molecular and cellular biology to assess whether power frequency electric and magnetic fields cause any adverse molecular and cellular effects that lead to cancer or other adverse human health effects.

The key point that needs to be understood about molecular and cellular biology and cancer, according to Dr. Gelmann, is that any agent that causes a change in DNA, that is, that causes a heritable genetic change, can have adverse effects. It is most important to understand that genetic change is necessary to create cancer cells. Once it occurs, the genetic change is permanent and is transmitted to "daughter cells." Thus, when a particular cell with a DNA change that causes cancer divides, all subsequent cells will be cancer cells.

Dr. Gelmann testified that the mutational analyses studies with electric and magnetic fields showed that exposure to 60Hz fields have no affects on mutations. Dr. Gelmann referred to the Frazier (1984) study which found no effect on the frequency of genetic changes in ovary cells, the Trent (1987) study which found no effect of power frequency fields with human colon cancer cells, and the Whitson (1986) study which found that DNA repair processes were not affected by exposure to power frequency fields.

Dr. Gelmann testified that chromosome studies concerned with 60Hz electric and magnetic fields showed that they were not associated with damage or other changes to chromosomes. Dr. Gelmann also reviewed other studies on cell proliferation, studies on DNA synthesis and cellular transcription and concluded after reviewing the in vitro studies that there is no persuasive scientific data showing that power frequency electric and magnetic fields in any way cause or promote cancer, and that these studies show no cellular or molecular damage or harm that could lead to adverse health effects.

In addition, Dr. Gelmann reviewed a number of animal studies that had been conducted in both controlled laboratory settings and with organisms living directly under transmission lines. One of the most important of theses studies is one by Benz and Carsten (1987). Benz and Carsten studied thousands of experimental animals during three generations of exposure to various levels of both electric and magnetic fields and they looked at many different indicators of health, including fertility, growth, development, mortality, general health, and genetic indicators. According to Dr. Gelmann the results of the Benz and Carsten research found no effects of power frequency field exposure on any of the many end points examined and the studies also demonstrated that exposure to power frequency of electric and magnetic fields did not cause, promote, or otherwise influence cancer or cause other adverse health effects.

Dr. Gelmann also reviewed tumor growth studies in which researchers either exposed cells to the agent in question, then

transplanted those cells to the animal host, or transplanted cells to the animal host and then exposed the entire organism to the purported agent of interest. Dr. Gelmann stated that tumor growth studies involving electric and magnetic fields showed no effect on the growth of cancerous cells or other adverse effects on health.

Finally, Dr. Gelmann came to the conclusion that sufficient molecular and cellular biology research had been conducted to adequately assess the possible risk of DNA change from exposure to electric and magnetic fields and that based upon his education, training, experience, and position within the field of molecular and cellular biology that no adverse effects of exposure to power frequency are indicated by the research in cellular and molecular biology, including the animal and tumor growth studies.

The third physician who testified in this docket for Public Service was Dr. Richard Steven Bockman, an Associate Professor of Medicine and an Associate Professor of BioChemistry at the Cornell University Medical College in New York. Dr. Bockman's other qualifications as an expert are set forth in Appendix B-3.

Dr. Bockman was asked by Public Service to examine whether power frequency electric and magnetic fields have adverse health effects on living systems, especially on the endocrine and immune systems; including effects on reproduction and development.

Dr. Bockman testified that power frequency fields are not stressors inasmuch as responses to electric fields at levels great enough to cause perception can cause a momentary rise in adrenal hormones, just like a noise or any other perceived stimulas of interest would, but that the hormones rapidly return to base line levels with the continuous exposure to power frequency fields. Dr. Bockman specifically stated that exposure to power frequency fields does not make a person more susceptible to disease or illness nor does exposure have any adverse effects on the immune system. According to Dr. Bockman, animals exposed or not exposed to electric fields behave in the same way to challenges by ineffective bacteria or viruses. Dr. Bockman discussed, in his testimony, the Krueger and Reed (1975) study and the Cerretelli (1979) study which found no differences in mortality between exposed mice in a control group of unexposed mice to a 75Hz electric field for 21 days.

Dr. Bockman also discussed studies in the area of reproduction and development and found that the effects of exposure to electric and/or magnetic fields did not reflect adverse effects on mammalian and non-mammalian reproduction and development. Dr. Bockman also discussed the Rommereim (1987) study in which multiple generations of laboratory rats were examined to determine whether chronic exposure to electric fields would produce any fetal effects. Dr. Bockman stated that no fetal malformations or other adverse birth-outcome effects were noted and that there were no effects on reproductive behavior, mortality, or body weights of the exposed offspring compared to the non-exposed control rats. Dr. Bockman concluded that as a result of a 1985 study on chick

embryos as well as a Benz and Carsten study at the Brookhaven National Laboratory on rats, that there was no indication of a dose-response relationship for measurements of fertility, body weight, or growth development.

Based upon his education and experience and review of the research in areas of endocrinology, immunology, and reproduction and development Dr. Bockman concluded that exposure to 60Hz electric and magnetic fields from electric lines fails to show adverse health effects on the endocrine or immune systems of the body or on reproduction and development.

Douglas County contends that Public Service failed to address many areas of human health and has focused only on the narrow specialties of its three expert witnesses. More specifically, Douglas County contends that Public Service has not addressed possible effects of electro-magnetic fields on learning, behavior, circadian rhythm, cancer promotion, calcium efflux, central nervous system function, or function at the cellular level other than as related to cancer initiation. One of the exhibits introduced in this docket was Exhibit K-7 which is a background paper entitled "Biological Effects of Power Frequency Electric and Magnetic Fields" commissioned by the Office of Technology Assessment from the Department of Engineering in Public Policy at Carnegie Mellon University (OTA Report). Douglas County contends that the two areas identified as most worthy of concern with respect to public health effects by the OTA Report, central nervous system effects and cancer promotion, were virtually ignored by Public Service's expert witnesses. Thus, according to Douglas County, even if Public Service's experts are deemed credible, they failed to establish that there are no adverse health effects associated with electro-magnetic fields. The OTA report commented on the status of scientific opinion on the effect of electro-magnetic fields as follows:

> As recently as a few years ago, scientists were making categorical statements that on the basis of all available evidence there are no health risks from human exposure to power frequency fields. In our view, the emerging evidence no longer allows one to categorically assert that there are no risks.

In the opinion of Douglas County, the fact that Public Service's three witnesses disagreed with the OTA Report's conclusions, and refused to allow any room for error, makes their opinions "patently unreasonable."

Douglas County presented the testimony of Dr. Daniel A. Goldstein and Dr. James P. Kornberg whose qualifications as experts are set forth in Appendix D-4 and Appendix D-5, respectively. These doctors acknowledged that they have no specific expertise, training, or research experience in any of the medical disciplines in which electric and magnetic field research has been conducted. Dr. Goldstein is trained in pharmacology and pediatrics and has practiced medicine for three years.

Dr. Kornberg is trained in occupational medicine and does not conduct research in medical specialties on a regular basis. Both of them devote a substantial part of their professional work to litigation and expert testimony. Dr. Kornberg conceded that he did not conduct a critical review of a specific study. Dr. Goldstein acknowledged that in forming an opinion about possible health risks, "primary" research sources, that is, the actual documented research, are more valuable than secondary sources in which studies are summarized by others. Nevertheless, Dr. Goldstein's review of the literature consisted largely of secondary sources.

Dr. Goldstein discussed a number of studies, the results of which he believed were inconclusive and not always consistent. The essence of his testimony was the proposition that the standard of proof in regulatory affairs must differ from that used in science. According to Dr. Goldstein, while it must be admitted at the outset that present data regarding biological effects of magnetic fields are inadequate to allow a final determination of the issues, there are clearly some indications of possible risk. He stated that, given the uncertainties of scientific research and the responsibility of regulatory bodies, the regulator, unlike the scientist, must consider possible as well as known risks. Dr. Goldstein acknowledges that there is no area where low intensity - low frequency fields have been definitively shown to have an adverse effect upon humans. However, he believes there are areas in which the existing literature indicates the need for further investigation in order to more fully exclude or to define the level of risk. For these reasons it was Dr. Goldstein's testimony that caution is warranted in allowing uncontrolled exposure of humans to magnetic fields.

With this proposition we agree. These areas include, (a) the relationship between power transmission structures and the induction of human cancers, (b) the relationship between electro-magnetic fields in the development of the human embryo and fetus as defined as by both anatomical and neuropsychological examination, (c) the relationship between electro-magnetic fields and infertility and reproductive loss, (d) the relationship between electro-magnetic fields and suicide, depression, or other psychological effects, (e) the relationship of magnetic field exposure to other disease states not so far investigated in available surveys, and (F) the possible mechanisms of bio-magnetic interaction, the understanding of which will allow a better extrapolation of available animal research.

Dr. Goldstein states there may be unknown risks which are assumed by a portion of the populace who live in close proximity to transmission equipment. Accordingly, he advises that caution is warranted on the part of regulatory bodies in order to protect the public from possible adverse effects of low frequency electro-magnetic fields. He believes that the unknown risk can certainly be reduced by the burial of transmission lines or increasing the width rights-of-way. Another alternative is the rerouting of electric power transmission through less populated areas.

Dr. Kornberg, who also testified on behalf of Douglas County, basically agreed with Dr. Goldstein's testimony. Dr. Kornberg was of the belief that there has been inadequate research performed to persuade him, as a practitioner of environmental medicine, that he should not be concerned about possible adverse effects related to electro-magnetic field exposure and that, accordingly, Public Service should delay proposed voltage upgrades and consider rerouting and line burial options until there is a greater scientific consensus on the matter of electro-magnetic fields in human health.

Dr. Kornberg discussed formaldehyde and asbestos in his testimony. Dr. Kornberg stated that besides its corrosive and irritant effects, formaldehyde was not recognized to be the insidious hazard which he says we know it to be today. In the 1950s there was emerging literature that formaldehyde can cause asthma, and in the early 1960s there was some evidence that it may be mutagenic in animals. Dr. Kornberg stated that extensive research during the 1950s and 1960s, however, revealed no evidence for any carcinogenic potential in either humans or animals. In 1981, the medical community was officially alerted to the human carcinogenic potential of formaldehyde. Likewise Dr. Kornberg made reference to the fact that despite some early reports in the late 1940s and 1950s that excess bronchogenic cancer in male asbestos workers was clinically emerging, asbestos continued to be used unabated until the mid 1970s.

Dr. Kornberg was of the opinion that the failure to recognize the magnitude of the asbestos problem resulted in delays in preventive action and undoubtedly also resulted in an increase in the size of our present day epidemic of asbestos-related disease. In Dr. Kornberg's opinion, if more attention had been paid to the "yet to be proven" asbestos-related disease association of the 1950s and 1960s, the search for asbestos alternatives and the development of better programs of exposure reduction and medical surveillance would have been accelerated.

We find that Douglas County's sweeping criticism of Public Service's medical experts is not well focused. As indicated above, Douglas County claims that no attention was given by Public Service's medical experts to such subjects as "learning, behavior, circadian rhythms, calcium efflux, central nervous function, immune response, and hormones and enzymes. With respect to cancer promotion, Dr. Labarthe did review all of the epidemiologic evidence in assessing whether 60Hz fields have a role in the development of cancer. And he also specifically addressed the subject of cancer promotion and concluded that there is no scientific basis to believe that electric and magnetic fields cause, promote, progress, or in any other way are associated with cancer.

The conclusion of the Public Service doctors and the Douglas County doctors, although differing in emphasis and focus, can be reconciled. As a result of the evidence presented in this docket on health effects, we arrive at the summary finding that, as of this time, there are no known or apparent adverse health effects resulting from electric and magnetic fields from low level overhead power transmission lines.

We acknowledge the possibility, with perhaps more humility than the Public Service experts, that future scientific and medical research may negate the truthfulness of this finding and that the exercise of "prudent avoidance" is appropriate. The necessity of our deciding what is in the public interest, in the face of man's awesome and growing power to effect the environment in which we live, is at once humbling and challenging.

E. Prudent Avoidance as it Relates to the Application for Upgrade

Since the Commission has adopted a finding that, as of this time, there is no known and demonstrable adverse health effect resulting from low level electromagnetic field produced by overhead power transmission lines, one of the policy options available to the Commission is to do nothing with respect to the health issue until the scientific information relating to power line health effects becomes more defined. A second option would be to advise the public of information available health issues, but take no further action. A third option which bears the appellation of "prudent avoidance" is to look for ways to minimize the possible adverse health effects, if such exist, consistent with the cost which would be required and our current scientific understanding about possible risks.

Prudent avoidance means the striking of a reasonable balance between avoiding potential harm and the attendant costs and risks. This Commission believes that prudent avoidance carries with it the common sense assumption that economic resources are not unlimited and that some prioritization needs to be made in how they are to be spent. In connection with this last point, there is the danger of over simplification and misunderstanding. We explain this economic point in the following way: Assume that there is a finite number of dollars to be spent for public health purposes, which amount of dollars is to be raised either through taxes or utility rates or a combination of the two. Assume for illustration purposes only, that a finite number of dollars only can be spent either for burying a power line (thus reducing possible harm from electric and magnetic emanations from overhead power lines), or the money could be spent for prenatal care. Where should the money be spent? Obviously, this Commission has no authority to spend money or to authorize the spending of money for prenatal care. However, the Commission can assess the possibility that in the above described scenario the authorization to spend money to bury power lines may well affect the economic possibility of spending money for prenatal care. In other words, if society has a finite number of dollars to spend on utility rates and to pay taxes, and if utility rates go up in order to pay for burying a power line, society would have less resources to pay taxes which, in turn, might be used to finance prenatal care or other clearly beneficial health programs. With commendable candor, Dr. Goldstein, Douglas County's witness, when questioned by Commissioner Nakarado on making a choice, based on current scientific knowledge, between spending money on prenatal care versus moving away from the right-of-way that had a transmission line, candidly opted for prenatal care.

The concept of prudent avoidance necessarily carries with it the exercise of prudential judgment. A quotation from the OTA Report illustrates this, as follows:

> For example, broccoli and cauliflower may contain anti-carcinogens. Dietary fiber may help to reduce the risk of certain cancers. Conversely char-grilled meats may carry increased risks of cancer. The evidence on these things is suggestive but inconclusive. As a matter of prudence many people have tried to increase the frequency with which they eat cauliform vegetables, increase their fiber intake, and reduce the amount of char-grilled meat they eat. But reasonable people do not rent a helicopter to fly high fiber bread into them when they spend a week at a mountain ski resort which serves only regular bread. Families who eat meat, would not buy lobster for their kids every night for a week at the same ski resort if it is the only meat on the menu that is not char-broilled. Nor do reasonable people rent their own refrigerated truck to supply them with broccoli and cauliflower when they travel in places where these foods are not available. Such steps go beyond prudence. At the least they would be foolishly expensive, at the worst signs of serious paranoia. OTA Report (Exhibit K-7) at page 79

Thus the question becomes how much is it prudent to spend, or to do, in order to reduce, but not necessarily eliminate, the risk of potential harm? We start with one of the observations made by the OTA Report that although it might make sense to avoid exposing people in siting <u>new</u> lines, but that in most cases, with our current knowledge, it would not make sense to tear out and rebuild old lines. In this docket, Public Service is <u>not</u> making an application to build <u>new</u> lines, but rather to upgrade <u>existing</u> lines. We find that the concept of prudent avoidance, in this context, does not extend to burying them. The additional cost would be approximately $13.5 million which we find would be an excessive expenditure of rate payer funds to reduce a risk, which Public Service's medical experts have said has not been shown to exit and which Douglas County's medical experts argue as potentially existing.

Currently about 390 people live within 500 feet of the transmission line. The record in this docket does not indicate that people will have significant exposure from the upgraded line at a distance of 500 feet. On the contrary, Public Service witness Silva stated that, in all probability, field levels within 180-200 feet of the upgraded line will be the same as the levels associated with a buried line. Even using the figure of 390 people and the $13.5 million actual

additional cost of burying the line, it is clear that burial of the line does not fit within the hypothetical level of a few thousand dollars per person investment in order to obtain prudent avoidance which is recommended in the OTA Report.

The policy of prudent avoidance means taking steps to reduce exposure at reasonable or modest cost. Such steps would include the use of reverse phasing on the line, higher ground clearances, and larger conductors than otherwise necessary. Public Service witness James Silva's Exhibit K-4b shows that the fields would be less using single steel poles as compared with using lattice towers because the conductors would be closer together. Accordingly, the fields would be attenuated. If the lines are configured as double circuit 230/230kv rather than double circuit 115/230kv and if one circuit has reverse phasing then there would also be a reduction in the fields because the fields from the reverse phasing will tend to cancel each other out. It is also true that in terms of magnetic field, the use of single steel poles rather than lattice towers would result in a reduction of exposure and in a lower magnetic field both on the right-of-way and on the right-of-way edges than exists at the present.

Public Service has agreed to forego an interim 115/230kv configuration and construct a 230/230kv configuration as well as using steel poles in lieu of lattice towers. Public Service has also indicated that the ground clearance for the upgraded line is more than required by National Electric Safety Code requirements of the line and that it will also use larger conductors than necessary. These proposals by Public Service will lower fields significantly, reduce noise, and thereby constitute a reasonable implementation of prudent avoidance.

It should also be noted that there was ample evidence in this docket, as exemplified by Mr. Silva's testimony in his Exhibits K3a and K3b that the general public encounters substantial electric and magnetic fields of numerous sources in everyday life which are not significantly different from those that will emanate from the proposed upgraded line. [1]

Intervenors James F. and M. Suzanne Weber, in their reply of Statement of Position, indicated that Public Service's existing easement is 80 feet wide with the power lines being positioned in the middle of the easement. The Weber's state that on the west side of this easement, Public Service owns another five feet of easement with purposes unknown to a Highlands Ranch business properties developer. Next to the five foot easement is a 60 foot easement owned by The Denver Water Board thus making a total air space easement of 145 feet wide. The Weber's suggest

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[1] For example, magnetic field levels from 230/230kv would involve a maximum value of 8-22 milligaus (mg) on the right-of-way and 3-12 mg at the edge of the right-of-way. By comparison, at the doll house display of the Colorado State Capital, the mg level was 87. Exhibit K-2 forcibly indicated that the mg levels from various appliances are typically much higher than would be experienced from an upgraded 230/230kv line.

that the Public Service poles be moved out to the middle of the 145 feet which they say is a much better 72 1/2 feet away from their property line. The Weber's also say that positioning the poles in this way would also be 72 1/2 feet away from future Highlands Ranch residents. Since the Public Service Lines are now 37 1/2 feet from the Weber's lot lines, this alternative, according to the Weber's, would give them 35 more feet and cause the milligauss levels to drop. Although this information was not formerly introduced during the hearing phase of this docket, we believe that Public Service should examine the possibility of positioning the steel poles on its right-of-way, taking into consideration other open right-of-way whether owned by Public Service or not, which will maximize the distance of the poles from residential and other inhabited properties. Finally, we believe that prudent avoidance means that Public Service should quantify and continue its support of industry research in this area and should begin to develop in-house capability to survey and measure electromagnetic fields. We will expect Public Service to submit its plan for further research and for its own survey of electromagnetic fields to the Commission within 90 days of this decision.

F. Conclusion

Based upon our foregoing findings, we conclude that the application filed by Public Service for approval to effect the transmission line upgrade, pursuant to § 30-28-127, C.R.S., is reasonable and should be approved. The approval, however, is granted subject to certain conditions which we believe operate to implement a policy of prudent avoidance of an unknown risk of potential harm due to electric and magnetic fields. Based upon what we know now, it can reasonably be anticipated that research into the relationship between electric and magnetic field emanations from overhead power lines to possible adverse health effects will be continuing for a number of years. Further research may well confirm the confident conclusions expounded by Public Service's three medical experts that adverse health effects are not known to exist and probably, do not exist. If further research tends to weaken or negate those conclusions, then regulatory bodies, such as this Commission, must respond accordingly.

The Commission will consider the feasibility of entering into rulemaking with respect to the entire issue of the design and placement of overhead power lines. At this point of time, the Commission is obliged to respond to the particular question posed to it by the need of Public Service's customers in the southeast metropolitan area for additional power, on a reliable basis, and the possible negative impacts which the proposed upgrade might have on the people who reside in certain specified portions of that southeast metropolitan area. We have done so, using our best judgment in response to the respective presentations of the parties in this docket. Finally, Public Service should be on notice that it is no longer acceptable to appear before the Commission to seek supply side enhancements to its system without apprising the Commission what efforts have been made, together with the results of those efforts, to reduce or mitigate the necessity of supply side enhancements with demand side alternatives. Public Service witness Mr. Martin acknowledged

that demand side alternatives are a legitmate Commission concern and will have to be addressed in future proceedings dealing with supply side enhancements. We find that Mr. Martin's commitment, presumably made with the knowledge and approval of Public Service, should be a further condition to the approval of this application.

As we have already indicated above, we believe that all of the parties, including the pro se intervenors who expended considerable time and effort in making their written and oral presentations to the Commission, have done an excellent job in providing this Commission a record upon which to base its decision.

THEREFORE THE COMMISSION ORDERS THAT:

1. The application of Public Service Company of Colorado, filed on January 12, 1989, seeking an Order permitting it to upgrade and provide betterments on existing 115kv transmission line located within Douglas County, Colorado, pursuant to the provisions of § 30-28-127, C.R.S., is granted subject to the following conditions:

A. The upgraded lines shall be configured at 230/230kv;

B. The lines shall be configured in reverse phase;

C. The transmission lines shall be strung on single steel poles in lieu of the present lattice towers;

D. Conductors and other equipment shall be used which will mitigate noise effects of the lines;

E. To the extent feasible, the single steel poles shall be placed on the Public Service Company of Colorado right-of-way-way, taking into consideration other open right-of-way whether owned by Public Service Company of Colorado or not, which will maximize the distance of the poles from residential and other inhabited properties.

F. Public Service Company of Colorado shall comply with the Commission's discussion in the conclusion above to address demand side reductions and mitigations in future proceedings dealing with supply-side enhancements.

G. Public Service Company of Colorado shall submit to the Commission its plan for further research regarding electromagnetic fields and its survey of its electromagnetic fields. Such plan shall be submitted to the Commission in writing within 90 days of the effective date of this Decision.

2. The 20-day time period provided for by § 40-6-114(1), C.R.S., to file an application for rehearing, reargument, or reconsideration begins on the first day after the mailing or serving of this Decision and Order.

Unless otherwise subsequently ordered by the Commission, this Decision shall be effective 30 days from this date.

DONE IN OPEN MEETING December 20, 1989.

(S E A L)

THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

ARNOLD H. COOK

RONALD L. LEHR

GARY L. NAKARADO

Commissioners

ATTEST: A TRUE COPY

James P. Spier
Executive Secretary

JEA:srs:0244A:jkm

PROCEDURAL HISTORY

On February 14, 1989, Public Service filed a motion for a prehearing conference to discuss issues such as discovery, prefiling dates, hearing dates, and related matters. Public Service in its motion, suggested that the prehearing conference be set for approximately ten days following the close of the intervention period. On March 1, 1989, the Commission entered Decision No. C89-296 which set a prehearing conference for March 10, 1989. In the same decision, the Commission granted intervenor party status to the Douglas County Board of County Commissioners, (Douglas County) Dr. John T. Zimmerman, Mr. William E. Myrick, and McArthur Ranch Associates.

On March 10, 1989, a prehearing conference was held before Administrative Law Judge Ken F. Kirkpatrick who had been designated as the Administrative Law Judge to handle preliminary matters in this docket. On March 21, 1989, Judge Kirkpatrick entered Decision No. R89-386-I which set hearing dates in this docket for September 11, 12, 14, 15, and 18, 1989. The decision also provided for the prefiling of testimony of the parties' direct cases (in question and answer format) and exhibits, provided for discovery dates, and granted Meracor Mortgage Corporation intervenor status in this docket. Finally, the decision ordered Public Service to file a motion in limine concerning issues in this docket on or before March 17, 1989, with special attention directed to the issue of property valuation. On March 31, 1989, Administrative Law Judge Kirkpatrick entered Decision No. R89-449-I which granted a motion that had been filed by Meracor Mortgage Corporation to withdraw as an intervenor in this docket.

On March 17, 1989, Public Service filed a "motion in limine concerning property values" which requested the Commission to enter an order limiting the introduction of evidence on property values at the hearing concerning Public Service's application in this docket. On March 31, 1989, William E. Myrick, on behalf of himself and McArthur Ranch Associates, filed a response to Public Service's motion and brief in limine concerning property values. On April 3, 1989, Douglas County filed a request to file out of time its answer brief in opposition to Public Service's motion in limine concerning property values because of difficulty arising out of technical computer problems. On April 3, 1989, Douglas County also filed its answer brief in opposition to Public Service's motion. On April 12, 1989, the Commission entered Decision No. C89-522 which allowed Douglas County to file its brief in opposition out of time and also set Public Service's motion in limine concerning property values for oral argument on April 25, 1989.

On April 19, 1989, the Commission entered Decision No. C89-559 which granted a motion which had been filed by Douglas County to amend a certain portion of its answer brief.

On May 10, 1989, the Commission entered Decision No. C89-665 which denied Public Service's motion in limine concerning property values. That decision acknowledged that this Commission is not a court and is not authorized to award damages as a result of possible diminution of property values which might be occasioned by the upgrade of the transmission line in Douglas County. Nevertheless, that decision also concluded that the Commission does not lack authority to consider the effect of possible property value diminution in making its overall determination of whether or not the proposed facilities are adequate and efficient and will promote the health, comfort, and convenience not only of the public utilities patrons and employees, but also the general public. The Commission, however, in Decision No. C89-665 did limit the manner and extent of testimony relating to possible diminution of property values, if any, which may result from the approval of the application to upgrade the transmission line from 115 KV to 230 KV. The Commission ordered that testimony and exhibits should relate solely to differences, if any, in property values between what properties are worth with a 115 KV line already in place and property values with a proposed 230 KV line. The Commission also limited the amount of hearing time and the number of witnesses related to the property diminution issue.

On April 25, 1989, Commission Counsel John E. Archibold transmitted to Public Service and the intervenors in this docket a Commission request for information setting forth eight questions to be answered by the parties. On June 7, 1989, by Decision No. C89-798, the Commission granted an extension of time to and including July 3, 1989, within which to answer the Commission's information request of April 25, 1989. On June 14, 1989, the Commission entered Decision No. C89-831 which granted, in part, a request by Douglas County for an extension of time within which to conduct discovery. That decision allowed intervenors to conduct discovery through July 3, 1989, and required Public Service to respond to discovery served upon it within 15 days.

On June 30, 1989, Douglas County filed a motion for an extension of all procedural dates in this docket. Public Service responded to that motion on July 6, 1989, generally opposing any extensions of time on the basis that it had retained experts to testify who would not be available when Douglas County proposed that the hearing be rescheduled. On July 12, 1989, the Commission entered Decision No. C89-977 which denied the motion for an extension of time filed by Douglas County. That

decision did grant an extension of time through July 17, 1989, within which Douglas County was to respond to Commission Counsel's letter of April 25, 1989. The decision also granted intervenor status to James F. Weber and M. Suzanne Weber with the proviso that they would take the docket as they found it.

On July 14, 1989, Douglas County filed a motion for reconsideration of the Commission's Decision No. C89-977 denying Douglas County's motion for an extension of procedural dates. On July 19, 1989, the Commission entered Decision No. C89-1017 which granted Douglas County's motion for reconsideration in part by adjusting certain discovery and prefiling dates.

On August 16, 1989, the Commission entered Decision No. C89-1145 setting a further prehearing conference for August 28, 1989, before Judge Kirkpatrick and granting two late filed requests filed, respectively, by R. Craig Ewing and Lawrence F. Herbert to intervene in this docket with the proviso that they would take this docket as they found it on the date of intervention.

On August 28, 1989, a second prehearing conference was held before Judge Kirkpatrick who, on August 31, 1989, entered Decision No. R89-1188-I which provided (1) that the hearing would proceed in three distinct phases dealing with (a) the need for the line (Phase I); (b) the non-need aspects of the line such as aesthetics, noise, and property values (Phase II); and (c) the health effects of the line (Phase III), respectively; (2) established an order of witnesses and an order of cross-examination; (3) provided for the identification of witnesses and exhibits, and (4) provided for the filing of summaries of testimony and known exhibits which Public Service might intend to offer in rebuttal in Phases I, II, or III of this docket. All parties stipulated not to challenge the expertise of other parties' expert witnesses.

Hearings in this docket commenced, as originally scheduled, on September 11, 1989, and continued on September 12, 14, 15, and 18, 1989. The witnesses who testified, the parties sponsoring the witness, the identification of the letter corresponding to the witness' direct testimony are set forth in Appendix A-2 to this decision. The exhibits that were introduced into evidence, while a particular witness was on the stand, were identified by the letter corresponding to the witness and a numerical designation in order. For example, Public Service's first witness, William J. Martin, was identified with the letter A, and his exhibits were identified as Exhibits A-1 through A-9 and A-11 through A-17.

At the conclusion of the hearings on September 18, 1989, the Commission orally directed that the parties could file statements of position on or before October 6, 1989, and reply statements of position on or before October 27, 1989. Statements of position were filed on or before October 6, 1989, by the following:

Public Service
Douglas County
Lawrence F. Herbert
James F. Weber

Reply statements of position were filed on or before October 27, 1989, by the following:

Public Service
Douglas County
James F. Weber
M. Suzanne Weber
John Zimmerman

JEA:0245A:jkm

| Exhibit No | Party and Witness | Description |
|---|---|---|
| A-13 | | Map of S-E Denver |
| A-14 | | 1st page of Public Service Company's response to Douglas County's Second Set of Interrogatories and Requests for Production of Documents. |
| A-15 | | Article entitled "Controlling Exposure to Transmission Line Electromagnetic Fields: A Regulatory Approach that is compatible with Available Science |
| A-16 | | Public Service Company Plan |
| A-17 | | Case Summary: Daniels Park-Greenwood 115 to 230 KV Uprate 1 |
| B | Public Service Company (Richard A. Keyser) | Prefiled Direct Testimony |
| B-1 | Public Service Company (Richard A. Keyser) | Public Service Company Line Length and Construction Cost Estimate, Overground v. Underground |
| B-2 | Public Service Company (Richard A. Keyser) | Public Service Company Line Length and Construction Cost Estimate of All 115 to 230 KV Upgrades Planned from 1989 through 1993 |
| B-3 | Public Service Company (Richard A. Keyser) | Public Service Company Line Length and Construction Cost Estimate for Conversion of all Denver Metro Area 230 KV Overhead Transmission Lines to Underground |
| B-4 | Public Service Company | Public Service Company Line Length and Construction Cost Estimate for Conversion of all Denver Metro Area 115 KV and 230 KV Overhead Transmission Lines to Underground |

# EXHIBIT LIST FOR 89A-028E

| Exhibit No | Party and Witness | Description |
|---|---|---|
| A | Public Service Company (William J. Martin) | Direct testimony |
| A (supplemental) | Public Service Company | Supplemental Testimony |
| A-1 | Public Service Company (James A. Ranniger) | Construction requirements data |
| A-2 | Public Service Company (Patrick W. McCarter) | Daniels Park-Greenwood 115,000/ 230,000 Volt Transmission Line Conversion |
| A-3 | | Transcript of hearing 7/26/88 |
| A-4 | Public Service Company | Map of Daniels Park-Greenwood bulk transmission system |
| A-5 | Public Service Company | Map of Metro transmission network |
| A-6 | Public Service Company | Southeast Load Area 576 MW. 1989 Winter Peak |
| A-7 | | Population Estimates for Arapahoe Co., Douglas Co Allocated Load Projection |
| A-8 | | Daniels Park-Greenwood 115/230KV Line Conversion, Alternatives |
| A-9 | | Letter to Kim Hainlen, Planner, from William J. Martin dated 9/30/88 |
| A-11 | | Allocated Coincidental Summer Peak Load Projection and Actual (mW) Fed from S-E Denver Area Transmission Lines |
| A-12 | | 1st page from Public Service Company's response to Douglas Counties First Set of Interrogatories and Request for Production of Documents |

| Exhibit No | Party and Witness | Description |
|---|---|---|
| D | Douglas County (James M. Summers) | Direct Testimony |
| D-1 | Douglas County (James M. Summers) | Allocated Coicident Summer Peak Load Projection |
| D-2 | Douglas County (James M. Summers) | Tables on Electric Energy Requirements in Gigawatts) |
| D-3 | Douglas County (James M. Summers) | Audible Noise Profile Ornamental Braced Pole |
| E | Public Service Company (Timothy P Dreese) | Direct Testimony |
| F | Public Service Company (David L. Adams) | Direct Testimony |
| F-1 | Public Service Company (David L. Adams) | Typical Activities-Sound Levels Reference and Community Responses |
| F-2 | Public Service Company (David L. Adams) | Adding dB Sources Logrithmically |
| F-3 | Public Service Company (David L. Adams) | Typical Human Reaction to Increases or Decreases in Sound Level |
| F-4 | Public Service Company (David L. Adams) | Transmission Line Sound Level Measurements (in dB) |
| F-5 | Public Service Company (David L. Adams) | Comparison of Octave Band Sound Pressure Levels (SPL) at Site No. 1 |
| F-6 | Public Service Company (David L. Adams) | Article entitled "IEEE Standard for the Measurement of Audible Noise from Overhead Transmission Lines" |
| F-7 | | Standard Handbook for Electrical |
| F-8 | | Public Service Company's Barr Lake Test Line Corona Noise Analysis |

| Exhibit No | Party and Witness | Description |
|---|---|---|
| F-9 | | Average Sound Levels |
| F-10 | | Standard Handbook for Electrical Engineers, P. 14-14 |
| F-11 | | Audible Noise Data Sheet |
| F-12 | | Energized v. Ambient Sound Levels |
| F-13 | | American National Standard, Methods for the Measurement o Sound Pressure Levels |
| G | Public Service Company (William T. Vancourt) | Direct Testimony |
| H | Douglas County (Jacqueline w. Davis) | Direct Fling |
| I | Douglas County (Peter D. Bowes) | Direct Testimony |
| J | Douglas County (Steven D. Wilson) | Direct Testimony |
| J-1 | Douglas County (Steven D. Wilson) | Douglas County Zoning Resolution Adopted 11/15/82 |
| J-2 | | Map |
| J-3 | | Memo From Kim Nainlen to Douglas County Board of Commissioners re update and overview of Daniels Park upgrade |
| J-4 | | Letter From Kim Hainlen to Douglas County Board of Commissioners dates 7/26/88 |
| J-5 | | Memo from Kim Hainlen to Douglas County Board of Commissioners dated 7/6/88 |
| K | Public Service Company (James Michael Silva) | Direct Testimony |

| Exhibit No | Party and Witness | Description |
|---|---|---|
| | | Engineers |
| K-1 | Public Service Company (James Michael Silva) | Electromagnetic Spectrum |
| K-2 | Public Service Company (James Michael Silva) | Magnetic Field Environment |
| K-3A | Public Service Company (James Michael Silva) | Untitled |
| K-3B | Public Service Company (James Michael Silva) | Untitled |
| K-4A | Public Service Company (James Michael Silva) | Public Service Summary of Midspan Electric and Magnetic Field Calculations for the Daniels Park-Greenwood Conversion (Table 1) |
| K-4B | Public Service Company (James Michael Silva) | Public Service Company Summary of Midspan Electric and Magnetic Filed Calculations for the Daniels Park-Greenwood Conversion (Table 2) |
| K-5 | Public Service Company (James M. Silva) | Master List for Mr. Silva |
| K-6 | | Pamphlet entitled "Electric and Magnetic Fields from 60 Hertz Electric Power: What Do We Know About Possible Health Risks?" |
| K-7 | | Paper entitled "Biological Effects of Power Frequency Electric and Magnetic Fields |
| L | Public Service Company (Darwin R. Labarthe) | Direct Testimony |
| L-1 | | Risk of Lung Cancer Relative to Cigarettes Smoked/Day |
| L-2 | | Cancer Risk in Relation to Electric and Magnetic Fields |
| L-3 | | Master List for Dr. Larbarthe |

| Exhibit No | Party and Witness | Description |
|---|---|---|
| H | Public Service Company (Edward Paul Gelmann) | Direct Testimony |
| N | Public Service Company (Richard S. Bockman) | Direct Testimony |
| N-1 | Public Service Company (Richard S. Bockman) | Master List for Dr. Bockman |
| O | Public Service Company (Daniel A. Goldstein) | Direct Testimony |
| O-2 | Douglas County (Robert H. Sarikas) | Douglas County's Responses to Public Service Company's Second Set of Interrogatories and Requests for Production |
| P | Douglas County (James P. Kornberg) | Direct Testimony |
| P-1 | Douglas County | Bibliography of James D. Kornberg, M.D. |
| P-2 | Douglas County | Interrogatories and Requests for Production to James R. Kornberg, M.D. |
| Q | Douglas County (Lawrence F. Herbert) | Prefiled Testimony |
| Q-1 | Douglas County (Lawrence F. Herbert) | Oversight Hearing 10/87--House of Representatives--Health Effects of Transmission Lines |
| Q-3 | | Book entitled "Interaction of Biological Systems and Static and ELF Electric and Magnetic Fields |
| Q-4 | | Article entitled "IBM Device uses Superconductors to Diagnose Epilepsy, Stroke |
| Q-5 | | Book entitled "The Electric Wilderness |

DR. LABARTHE

Dr. Labarthe serves as a professor of epidemiology and adjunct professor of medicine, Director of the Epidemiology Research Center, Director of the Southwest Center for Prevention Research, and is Associate Director of the Institute of Environmental Health. Dr. Labarthe is also Director of the Design and Analysis Unit at the Baylor College of Medicine. Reflective of Dr. Labarthe's expertise in the field of epidemiology, he is a Fellow of the American College of Preventive Medicine, a member and past chairman of the Council on Epidemiology of the American Heart Association, a member and past president of the Society for Epidemiological Research, and a member and past chairman of the Epidemiology Section of the American Public Health Association. As Director of Research Groups at the University of Texas, Dr. Labarthe evaluates epidemiologic research proposals, manages epidemiologic research projects and conducts independent research in the area of epidemiology. In particular, Dr. Labarthe researches environmental factors and other issues which are potential areas of concern for human health. He has conducted pediatric studies relating to the general health status of children, participated in the design and analysis of a prospective epidemiologic study of junior high and high school children, and has collaborated on epidemiologic studies on various health in points in approximately 14 different countries. Most of his work in epidemiologic studies have included cohort studies, population surveys, case-control studies, clinical/community trials, and community surveillance studies. Most of Dr. Labarthe's work has concerned chronic diseases, such as cancer as distinguished from infectious diseases.

Dr. Labarthe has published over 50 articles on epidemiology and co-authored more than 15 book chapters and monographs and has published his epidemiologic research in 6 scientific journals, including American Journal of Epidemiology, Annals of Clinical Research, Journal of the American Medical Association, Journal of Chronic Disease, Journal of Clinical Epidemiology, and Cancer. This is a "case-control" study.

Epidemiology is the study of disease in human populations, and epidemiologic studies are undertaken to describe the occurrence of disease in populations and to identify the causes of disease. When the purpose of a study is to understand causation, several approaches are possible. One approach in epidemiology is to compare rates of disease in populations with different exposures. These studies are called "cohort" studies. Another approach is to compare exposures in individuals who have developed a particular disease - the "cases" - with exposures in a comparable group that have not developed a disease - the "controls." This is a case control study.

It is important to consider the epidemiologic research as a whole and look for consistency both within and amongst studies to determine whether statistical correlations are biologically meaningful. Public Service witness, Dr. Labarthe, considered over 35 epidemiological studies in addition to the one by Wertheimer and Savitz which was cited by Douglas County. Douglas County opines that Dr. Labarthe discounted the findings of Wertheimer and Savitz whereas Dr. Labarthe actually said that the Savitz study supports his conclusion. Dr. Labarthe also testified that, considered in proper context with all of the epidemiologic research, the Wertheimer and Savitz studies do not provide a scientific basis for concern about health effects from powerline fields.

DR. GELMANN

Dr. Gelmann has been associated with the National Cancer Institute which is an organization chartered by the United States Congress and is the nation's largest biomedical center involved with cancer research. The National Cancer Institute is a part of the National Institutes of Health (NIH). Dr. Gelmann reviews grant proposals for NIH projects and he serves on a study section for the National Institutes of Allergy and Infectious Diseases, namely the Micro-Biology and Virology Research Committee. He also regularly reviews articles that are being considered for publication in scientific journals such as Cancer Research, International Journal of Cancer, Journal of the National Cancer Institute, Proceedings of the National Academy of Science, Journal of the Clinical Oncology, The New England Journal of Medicine, and others. Dr. Gelmann has spoken on cancer and cellular biology at numerous national and international scientific conferences, and has received a decoration and citation from the United States Public Health Service for his work in cancer research. He serves as liaison between the American Society of Clinical Oncology and the National Cancer Advisory Board, the latter being a committee of sciences, physicians, and lay people who oversee cancer research policy in the United States which committee is appointed by the President of the United States.

Dr. Gelmann described the basic structure and function of the cell which is the basic building block of the human body. Cells make up all the systems of the body, including the muscular, skeletal, nervous, and circulatory systems. Within the cell is the nucleus, and the chromosomes reside within the nucleus. The chromosomes are composed of molecules of DNA. DNA contains the genetic information which provides a blueprint for all inherited characteristics. This genetic information is contained in discrete subunits of the DNA known as the genes. For this reason, DNA is known as the genetic material. DNA is necessary for the cell to perform its functions. Because DNA contains the essential information for all cell functions, change to the DNA molecule, that i.e., genetic change, can have serious effects on cell processes and therefore on tissues and organisms. Subtle changes in the DNA molecule can be responsible for making a normal cell become a cancer cell, but most change that occurs in DNA does not result in cancer, or for that matter in any demonstrable effect. The cell has repair mechanisms that can correct change, in some degree, to DNA. Change in the DNA molecule or other molecules within the cell can also cause other adverse effects in the human body such as problems with reproduction, growth, metabolism, and development.

Dr. Gelmann stated that it is important to realize that cancer is a generic term to describe many different types of diseases. Each cancer type has unique characteristics, including where it occurs and its causes. For example, ultra-violet light from the sun changes the DNA of skin cells and causes melanomas and other skin cancers but does not cause lung cancer. Cigarette smoking, on the other hand, can deposit substances in the cells of the lung which can change their DNA and thus lead to lung cancer, but smoking does not cause skin cancer. To determine whether some agent causes cancer, scientists conduct laboratory studies on isolated cells and tissues under controlled laboratory conditions as well as laboratory and field studies on intact animals. Dr. Gelmann described the various types of studies that have been conducted with electric and magnetic fields, including studies which he categorized in four areas: mutational analyses studies, chromosome studies, animal studies, and tumor growth studies.

Mutational analyses are in vitro tests that show whether a heritable change has occurred in the chemical structure of the DNA molecule as a result of exposure to an agent.

The chromosome level studies, which are in vitro studies, evaluate whether there are breaks or other damage to the chromosome as a result of exposure to an agent. Because chromosomes are made of DNA and change to DNA is necessary for cancer to occur, these studies are important in addressing an agent's potential to cause cancer or other adverse health effects. A number of diseases, including chronic myelogenous leukemia and downs syndrome have been shown to be linked to abnormalities in chromosomes.

Dr. Gelmann addressed the subject of cancer promotion as well as the issues concerning immune response and calcium efflux. He examined studies on cell proliferation, RNA synthesis, RNA transcription, and ornithine decarboxylase which, contrary to Douglas County's assertion, deal directly with functions at the cellular level other than as related to cancer initiation. The list of studies which Dr. Gelmann reviewed and relied upon include every cancer promotion study referenced in the OTA Report as well as studies not considered in the report. Dr. Gelmann concluded that there was no persuasive scientific data showing that power frequency electric and magnetic fields in any way cause or promote cancer.

DR. BOCKMAN

Dr. Bockman holds a Ph D. in Bio-Chemistry from the Rockefeller University and while at that university he was awarded an NIH Fellowship to perform graduate studies in biological chemistry. That research involved the use of magnetic resonance to study the effects of very high intensity magnetic fields (10,000,000-15,000,000 milligauss) on molecules in solution. This research tool has been adapted for medical imaging of the human body. Dr. Bockman's early training was in immunology which is the medical discipline that studies the network of cells and tissues that protects the body from disease. He is a board certified specialist in internal medicine and has as his medical subspecialty endocrinology. Endocrinology is a subspecialty of internal medicine in which one studies and treats hormonal and metabolic balances and how those balances may be altered by external and internal factors.

The endocrine system refers to those biological systems whose functions can be modulated or altered by hormones. These include the neuroendocrine, adrenal, and reproductive systems. These systems exhibit a variety of responses as to the result of our reactions to everyday stimulae. Stimulae constitute biologic effects, but that does not necessarily mean that they are harmful. For example, the every day environment is filled with sights, sounds, smells, and other stimulae that generate measurable biological responses or biological effects. An exchange stimulus may result in a bodily reaction which is known as "stress." In a normal response, there are brief and temporary changes in neuroendocrine's responses such as neural responses, heart rate, and adrenalin levels, but these quickly return to base line levels. By way of contrast, a stressful stimulus causes a continual outpouring of neuroendocrine substances that are maintained in a high level. The failure to return to the base line level is what is known as a "stress response."

Dr. Bockman considered relevant studies in the areas of immunology, endocrinology and neuroendocrinology which included every study in the OTA Report and a great many more dealing with calcium efflux, hormones and enzymes, neuro-transmitters, immune response, learning behavior, circadian rhythms, and central nervous function. As we read the testimony, it does seem evident that the Public Service medical experts were not persuaded by the few "positive" studies which suggest a relationship between overhead transmission lines and certain adverse health effects. Scientists, however, do not consider studies in isolation nor are they guilty of "discounting" studies when they examine all the research to look for replication, consistency, biologic plausibility, or the biologic significance of experimental results. In epidemiology, one must exercise caution in drawing any conclusion from one or two studies.

JEA:0246A:jkm:srs

## DR. DANIEL A. GOLDSTEIN

Dr. Goldstein practices medicine in Denver, Colorado. His background includes an undergraduate degree cum laude in molecular biology from the University of Wisconsin. After receiving an undergraduate degree, Dr. Goldstein did a year of graduate work in the Department of Genetics which included detailed course-work in the field of genetics as well as research in the area of immunology. He subsequently obtained a Doctorate of Medicine from the Johns Hopkins University and completed a three-year residency in pediatrics at the same institution. This was followed by a two-year fellowship in pharmacology and toxicology at the University of Toronto which fellowship included extensive training in the edpidemiology and biostatistics. Dr. Goldstein has been engaged in the practice of general toxicology, with extensive patient care responsibilities, for the past two years.

Dr. Goldstein is currently certified by the American Board of Medical Toxology, the American Board of Pediatrics, and the Royal College of Physicians and Surgeons of Canada (Pediatrics).

DR. JAMES P. KORNBERG

Dr. James Phillip Kornberg is a physician and environmental engineer from Boulder, Colorado. He received a Bachelor of Science Master of Degree in Aeronautical and Astronautical Engineering at the Massachusetts Institute of Technology. He also earned a Doctor of Science and Environmental Health Sciences and Engineering at Harvard University and was awarded a Doctor of Medicine Degree from Dartmouth Medical School. He completed an internship at Columbia University teaching hospital in Cooperstown, New York and them completed residency training and occupational medicine at Harvard University. In 1980 he completed all examinations necessary to become Board certified as a specialist in occupational medicine. Dr. Kornberg is engaged in the full-time clinical and consoling practice of occupational and environmental medicine. Occupational medicine is primarily directed toward the management of risk and reduction of morbidity and mortality among individuals employed within the work force.

On a daily basis, Dr. Kornberg's practice consists primarily of the following activities:

- The design and implementation of health maintenance and health surveillance medical programs for a variety of industries, businesses, and governmental agencies. These programs include the design and administration of pre-placement (pre-employment) physical examinations, interim, fitness and, on occasion, termination of employment evaluations.

- Treatment and evaluation of injured workers.

- Specialty, referral evaluation of individual workers who present with medical or psychological conditions which are possibly caused or aggravated by workplace conditions.

- Development of occupational medical risk management strategies for employers directed at reducing injuries and illnesses in the workplace. As a corollary to this effort, I am involved on a regular basis with the development of regulatory compliance and preventive medicine educational programs for workers. One good example of such program development is the design and implementation of a Medical Respirator Certification

Program for employers who must comply with OSHA Standard 1910.134 before they can issue respirators to their employees. Another example is the design of a comprehensive medical evaluation program for asbestos removal workers, whose medical surveillance program must be in compliance with the Federal Asbestos Standard (29 CFR Parts 1910.1001 and 1926). Finally, I am involved on a regular basis with occupational medical programs for workers who are at risk from environmental exposure, for example, during the cleanup of hazardous waste sites. (Superfund Amendments and Reauthorization Act (SARA) - 1986, Section 126,(b); OSHA 29 CFR 1910.120).

Dr. Kornberg's work in the field of environmental medicine includes:

- Participation in the performance of public health risk assessments, as part of the EPA, requirements for remediation of hazardous waste sites. (SARA, Title III, Subtitle C, Section 323[c][2]). Regulatory imperatives for this type of work include, among other tasks, assessing exposure of persons living in a local community to the hazards of specific chemicals and conducting studies to determine the health effects of exposure. In this regard, as a primary medical investigator for one client which owns and operates a uranium mill south of Denver, I prepared a comprehensive Environmental Health Risk Survey Document outlining the environmental impact of 11 potentially toxic metals (9/86). This document examined the potential impact of each metal upon eleven environmental target categories, ranging from human health and plant life to soil, sediments, and insects.

- Advising municipal and/or governmental agencies on policies which may directly impact public health and safety; for example, the development of appropriate programs for spraying public lands with

herbicides or pesticides, with particular emphasis upon the type of material which can be used, the manner in which they should be used, the appropriate warnings which should be given to the public, and the time duration beyond which public access can be safely permitted.

- The conceptualization of possible environmental impact and public safety problems, associated with airborne, waterborne, and solid waste from client company facilities.

- The evaluation of possible adverse health effects of new technology programs both upon the public and upon the individual workers present at the job site. In 1978, for example, I was director of a Federal NIOSH program (Energy Industries Medical Protocol: Contract 210-78-0100) to study the overall health effects of a variety of coal gasification and coal liquefaction (synthetic fuels) methodologies. I have also served as consulting medical director to one company which has developed a unique technology for disposal of municipal wastes through deep well injection, combined with oxygenation under pressure.

Dr. Kornberg performs off-site industrial plant walk-through evaluations and is able to perform initial work site hazard evaluations and to offer advice for hazard elimination or mitigation. On the environmental side, Dr. Kornberg's background training as an environmental engineer allows him to deal directly with problems of environmental pollution and, as an occupational physician, to interpret the significance of that pollution upon individuals or groups of individuals within the population.

ORIGINAL

COMMONWEALTH OF PENNSYLVANIA

NVL

OFFICE OF CONSUMER ADVOCATE
1425 Strawberry Square
Harrisburg, Pennsylvania 17120

RECEIVED
JAN 3 1991
SECRETARY'S OFFICE
Public Utility Commission

IRWIN A. POPOWSKY
Consumer Advocate

January 3, 1991

(717) 783-5048

Jerry Rich, Secretary
PA Public Utility Commission
Room G-18, North Office Bldg.
Harrisburg, PA 17120

Re: Letter of Notification
of Philadelphia Electric
Company Re: Proposed 230 KV
Woodbourne to Heaton
Transmission Line,
Docket No. A-110550F055

Dear Secretary Rich:

Enclosed please find for filing an original and three copies of the Office of Consumer Advocate's Notice of Intervention and Statement of Office of Consumer Advocate in Support of The Emergency Petition of Non-Noticed Property Owners to Reopen and Suspend in the above-captioned proceeding.

Copies have been served upon all parties of record as shown on the attached Certificate of Service.

Sincerely,

Tanya J. McCloskey

Tanya J. McCloskey
Assistant Consumer Advocate

DOCUMENT FOLDER

1116
Enclosures
cc: All parties of record
Hon. William H. Smith, Chairman
Hon. Joseph Rhodes, Vice Chairman
Hon. Frank Fischl, Commissioner
Hon. David W. Rolka, Commissioner
Hon. Wendell F. Holland, Commissioner
Office of Special Assistants
Law Bureau

CERTIFICATE OF SERVICE

Re: Letter of Notification
of Philadelphia Electric
Company Re: Proposed 230 KV
Woodbourne to Heaton
Transmission Line,
Docket No. A-110550F055

I hereby certify that I have this day served a true copy of the foregoing document, Notice of Intervention and Statement of Office of Consumer Advocate in Support of The Emergency Petition of Non-Noticed Property Property Owners to Reopen and Suspend, upon parties of record in this proceeding in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant), in the manner and upon the persons listed below:

Dated this 3rd day of January, 1991.

SERVICE BY FASCIMILE AND FIRST CLASS MAIL

Robert J. Sugarman, Esquire
Sugarman & Associates
16th Floor, City Place
101 North Broad Street
Philadelphia, PA 19107

Donald Blanken, Esquire
Counsel for
Philadelphia Electric Company
2301 Market Street
Philadelphia, PA 19101

Tanya J. McCloskey
Assistant Consumer Advocate

Counsel for Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120
(717) 783-5048

ORIGINAL

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

RECEIVED
JAN 3 1991
SECRETARY'S
Public Utility Commission

| | | |
|---|---|---|
| In Re: Letter of Notification | : | |
| Of Philadelphia Electric Company | : | |
| Under 52 Pa. Code §57.72(d) | : | Docket No. A-110550F055 |
| Re: Proposed 230 KV Woodbourne | : | |
| To Heaton Transmission Line | : | |

DUPLICATE RECORD!
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT!

NOTICE OF INTERVENTION

Pursuant to 52 Pa. Code §§ 5.71-74, the Office of Consumer Advocate hereby gives Notice of Intervention in the above-captioned proceeding. A copy of all correspondence and notices, documents, orders or other communications with respect to the above-captioned proceeding should be addressed to the following:

FILED
JAN 10 1991

Tanya J. McCloskey
Assistant Consumer Advocate
Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120

Respectfully submitted,

DOCUMENT FOLDER

Tanya J. McCloskey
Assistant Consumer Advocate

DATED: January 3, 1991

PUBLIC STATEMENT OF THE CONSUMER ADVOCATE ISSUED IN ACCORDANCE WITH SECTION 904-(e) OF ACT OF APRIL 9, 1929 (P.L. 177, No. 175), KNOWN AS "THE ADMINISTRATIVE CODE OF 1929", AS AMENDED BY ACT 161 OF 1976 (APPROVED JULY 9, 1976)

Act 161 of the Pennsylvania General Assembly, 71 P.S. § 309-1, et seq. as enacted July 9, 1976, authorizes the Consumer Advocate to represent the interests of consumers before the Pennsylvania Public Utility Commission (PUC or Commission). In accordance with Act 161, and for the following reasons, the Consumer Advocate determined to file a Notice of Intervention and participate in proceedings before the Commission involving Philadelphia Electric Company (PECO).

On November 21, 1989, PECO filed a Letter of Notification requesting the PUC's approval of a proposed 12.8 mile 230 kilovolt (KV) transmission line to run along a railroad right-of-way. PECO used a short form application on the premise that its proposed transmission line was only an increase in voltage and reconstruction of an existing high voltage transmission line. The existing transmission line was constructed by Conrail for its own use. The PUC approved the letter of notification by order dated February 9, 1990 based on PECO's presentation and the absence of protest from those given notice of PECO's request. Certain non-noticed property owners filed an Emergency Petition to Intervene, Reopen and Suspend Approval with the PUC on September 14, 1990. These Petitioners contend that the abbreviated approval process was inappropriate and denied them an opportunity to express their concern for health and safety issues raised by the proposed 230 KV transmission line. The PUC has not yet acted to grant or deny the petition.

The Consumer Advocate has reviewed the record and given the PUC notice of its intervention in the matter. The OCA has also filed a statement in support of the petitioners' request that the PUC suspend and reopen the matter. Without taking a position on the merits of petitioner's claims, the OCA submits that the PUC may best protect the public interest by permitting a full hearing in this matter. The OCA has requested that the PUC order a public hearing with notice by publication to afford all possibly interested parties an opportunity to participate in the PUC's review of PECO's proposed transmission line. The Consumer Advocate's objective is to see that the PUC applies its regulations in a manner to best provide consumers with reasonable and safe utility service.

ORIGINAL

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

| | | |
|---|---|---|
| In Re: Letter of Notification Of Philadelphia Electric Company Under 52 Pa. Code §57.72(d) Re: Proposed 230 KV Woodbourne To Heaton Transmission Line | : : : : : | Docket No. A-110550F055 |

RECEIVED
JAN 3 1991
SECRETARY'S OFFICE
Public Utility Commission

STATEMENT OF
THE OFFICE OF CONSUMER ADVOCATE
IN SUPPORT OF THE
EMERGENCY PETITION OF NON-NOTICED
PROPERTY OWNERS TO REOPEN AND SUSPEND
APPROVAL OF THE LETTER NOTIFICATION
OF PHILADELPHIA ELECTRIC COMPANY FOR
THE PROPOSED WOODBOURNE-HEATON
TRANSMISSION LINE

DOCKETED
JAN 10 1991

DOCUMENT
FOLDER

## I. INTRODUCTION

The Office of Consumer Advocate (OCA) has reviewed the pleadings in the above-captioned matter and has given Notice of Intervention to the Public Utility Commission. The OCA takes no position with respect to the merits of Philadelphia Electric Company's request for approval of its proposed transmission project. The OCA also takes no position with respect to the substantive merits of the objections raised by the Petitioning Non-Noticed Property Owners (Petitioners). The OCA does, however, support the request of Petitioners to reopen this proceeding so that they may have a hearing on their concerns. It is OCA's position that the Letter of Notification procedure utilized by the Commission in this case is inadequate in light

of the concerns raised by Petitioners and that the Commission should order a hearing on this matter.

II. DISCUSSION

On November 21, 1989, PECO filed a Letter of Notification requesting the PUC's approval of a proposed 12.8 mile 230 kilovolt (KV) transmission line to run along a railroad right-of-way. PECO used a short form application on the premise that its proposed transmission line was only an increase in voltage and reconstruction of an existing high voltage transmission line. The existing transmission line was constructed by Conrail for its own use, but the line had been out-of-service for several years. The PUC approved the letter of notification by order dated February 9, 1990 based on PECO's presentation and the absence of protest from those given notice of PECO's request. Certain non-noticed property owners filed an Emergency Petition to Intervene, Reopen and Suspend Approval with the PUC on September 14, 1990. These Petitioners contend that the abbreviated approval process was inappropriate and denied them an opportunity to express their concern for health and safety issues raised by the proposed 230 KV transmission line. The PUC has not yet acted to grant or deny the petition.

Upon reviewing the pleadings of the parties and the applicable regulations, the OCA has determined to intervene in this matter and to support the procedural request of the Petitioners. Without addressing the merits of the Petitioners' health and safety concerns, the OCA submits that this case

should not be determined on the basis of the abbreviated Letter of Notification procedure.

First, the Commission's reliance in its February 9, 1990, Order on the fact that "no protests have been received", is misplaced. It is now clear that the reason no protests were received was because the property owners who now claim they will be harmed by the project did not receive notice of the Letter of Notification. If PECO had been required to follow the full application procedure, a hearing would have been provided and the Company would have been required to give general notice of such hearing pursuant to 52 Pa. Code §57.75.

Second, while PECO contended -- and the Commission initially found -- that the Letter of Notification procedure was appropriate because the proposed project "will not substantially alter the existing ROW," that is a factual determination which has now been challenged by the Petitioners. With respect to PECO, this is a new transmission line which has not been previously examined by the Commission. With respect to neighboring property owners, they are seeing a change from an abandoned railroad power-line, which "operated" at zero voltage for several years, to an electric utility power line which will operate continuously at a 230 kilovolt level. Again, without addressing the merits of the Petitioners' claims with respect to the potential dangers of increased exposure to electromagnetic fields, there has been a sufficient change in the existing right of way to justify a hearing on the Petitioners' contentions.

Indeed, a review of the Commission's published Order at the time the current transmission siting regulations were promulgated supports the Petitioners' view. A copy of that Order is attached as Appendix A to this Statement. In that Order, the Commission specifically cautioned the utilities not to assume that "an increase in the voltage of an existing HV line can not result in a substantial alteration of the right-of-way." Rather, the Commission stated:

> Our regulations do not prohibit us from rejecting a letter of notification and directing that a siting application be filed if we feel that the change in voltage, and the corresponding change in electromagnetic and electrostatic fields, is significant enough to result in a substantial alteration of right-of-way.

13 Pa. Bulletin 131, 133 (January 8, 1983) (Emphasis added). Thus, the Commission foresaw the very type of challenge raised in the present case and recognized that such a challenge may well warrant the use of the full application and hearing process.

WHEREFORE, the Office of Consumer Advocate notes its intervention in this proceeding and respectfully requests this Commission to grant the Petition of the Non-Noticed Property Owners to reopen this proceeding and provide a hearing on this matter so that the concerns raised by Petitioners may be adequately addressed.

Respectfully submitted,

Tanya J. McCloskey

Tanya J. McCloskey
Assistant Consumer Advocate

For:
Irwin A. Popowsky
Consumer Advocate

Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120
(717) 783-5048

Dated: January 3, 1991

| *Pennsylvania Emission Data System Identification Number* | *Source* |
|---|---|
| C02 | AAF Rotoclone No. 5 |
| C03 | AAF Rotoclone No. 6 |
| C04 | Buell Cyclone |
| C06 | AAF Rotoclone No. 4 |
| C07 | AAF Rotoclone No. 1 |
| C08 | AAF Rotoclone No. 2 |
| C09 | AAF Rotoclone No. 3 |
| C10 | W. W. Sly Baghouse No. 5 |
| C11 | W. W. Sly Baghouse No. 2 |
| C13 | W. W. Sly Baghouse No. 4 |
| 220 | Sinter Windbox No. 1 |
| 230 | Sinter Windbox No. 2 |

(b) The owner or operator shall not cause or permit the emission of particulate matter for each source as listed in subsection (a) in excess of the applicable emission rate as listed in the following table:

| *Pennsylvania Emission Data System Identification Number* | *Source* | *Pounds of Particulate Matter Per Hour* |
|---|---|---|
| C02 | AAF Rotoclone No. 5 | 4 |
| C03 | AAF Rotoclone No. 6 | 4 |
| C04 | Buell Cyclone | 7 |
| C06 | AAF Rotoclone No. 4 | 4 |
| C07 | AAF Rotoclone No. 1 | 6 |
| C08 | AAF Rotoclone No. 2 | 5 |
| C09 | AAF Rotoclone No. 3 | 2 |
| C10 | W. W. Sly Baghouse No. 5 | 5 |
| C11 | W. W. Sly Baghouse No. 2 | 5 |
| C13 | W. W. Sly Baghouse No. 4 | 3 |
| 220 | Sinter Windbox No. 1 | 110 |
| 230 | Sinter Windbox No. 2 | 110 |

(c) The sources identified in subsection (a) as Pennsylvania Emission Data System Identification Number 220 and 230 shall be relieved from compliance with the otherwise applicable requirements of § 123.13(b) (relating to processes) when in compliance with this section and the terms and conditions contained in the permit to operate issued under this section.

(d) U. S. Steel shall implement a program to reduce fugitive particulate air contaminants, by 138 pounds per hour per operating sinter line, as specified in the conditions contained in Permit No. 09-324-001.

(e) This section shall become null and void on December 31, 1985 unless reenacted.

[Pa. B. Doc. No. 83-62. Filed January 7, 1983, 9:00 a.m.]

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# Title 52— PUBLIC UTILITIES

## PART I. PENNSYLVANIA PUBLIC UTILITY COMMISSION

## [52 PA. CODE CH. 57]

[L-820071]

### Electric Service

At its public meeting on November 19, 1982, the Pennsylvania Public Utility Commission adopted the above-captioned proposal which was originally published at 12 Pa. B. 1771 (June 5, 1982). These amendments are effective on January 8, 1983.

Public Meeting held
November 19, 1982

*Commissioners Present*: Susan M. Shanaman, Chairman; Michael Johnson; James H. Cawley; Linda C. Taliaferro; and Clifford L. Jones.

### Order

*By the Commission*:

This proceeding was opened by Commission Order adopted April 22, 1982, entered April 28, 1982 and published for comment at 12 Pa. B. 1771 (June 5, 1982). Fiscal Note PUC L-829971 was published at 12 Pa. B. 1774. Comments were filed by Duquesne Light Company, Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company, Pennsylvania Power and Light Company, Philadelphia Electric Company, UGI Corporation, West Penn Power Company and the Pennsylvania Department of Environmental Resources. This Order discusses and sets forth the final rule which has resulted from the comments filed. We shall discuss each section chronologically, the only exception to this being Section 57.1 (Definitions) which is included in the discussion of the Siting Regulations.

*Section 57.14 — Service voltage.* The proposed revisions to this Section changed "service rendered primarily for lighting purposes" to "service rendered primarily at secondary voltages" and also changed "service rendered primarily for power purposes" to "service rendered at primary voltages." In addition, this section was revised to tighten allowable voltage variations and provided for a penalty to be payed to a customer if voltage varies in excess of the allowa-

ble limits. The comments pointed out that the use of the terms "secondary service" and "primary service" will create unnecessary confusion; that voltage variation exceeding the present range is present under normal operating conditions due to factors beyond utility control; that existing systems are built and operated to comply with current variations provided for in the current regulations; that it would be extremely expensive and time-consuming to rebuild systems to comply with the more restrictive variations while the benefit to customers would be minor; that quite often customer equipment and property is not damaged by excess voltage variations and that a customer would be unjustly enriched by collecting a penalty under such circumstances; that the Public Utility Code provides for Commission complaint proceedings if inadequate service is rendered; that an action in common pleas court can lead to a recovery of damages resulting from excess voltage variations within a utility's control. We agree. For these reasons, and for other reasons not listed above, we shall delete the proposed changes. However, we shall maintain the ± 5.0% variation with a maximum of 8.0% for service rendered primarily for lighting purposes in subsection (b).

The phrase "during normal system operation" has been added to subsections (b) and (c) so that, as PP&L points out, temporary abnormal or emergency operating conditions do not result in a violation of this regulation. This change suggested by PP&L, and other changes suggested by the comments which are discussed below, clarify the meaning of the existing regulations. For this reason, further publication is not required.

Another alteration suggested by PP&L, which we shall adopt, is to change the word "nominal" to "normal" in subsection (c) to avoid an unduly restrictive application to PP&L's primary service system. PP&L's 69 KV customers are normally served at voltage levels between 62 and 69 kV, and both PP&L's and the customer's equipment have been purchased and designed to operate at these levels. The change to the word "normal" will avoid unnecessary penalties.

Met-Ed and West Penn request clarification of the term "service terminal" in subsections (b) and (c) because a utility can not control the voltage at the point where large power users perform their own transformation to serve their own equipment. We shall do so by inserting in § 57.1 (Definitions) a definition of the term "service terminal" which is compatible with the definition of the term "service line".

*Section 57.19 — Line extensions.* At Met Ed's suggestion we shall amend proposed subsection (f) so that it is clear that "new residential developments" refer only to residential developments as defined in § 57.81.

*Section 57.20 — Watt-hour testing.* We proposed changing § 57.20(e)(3)(iv)(B)(I) so that this subclause refers to the Public Utility Code instead of the Public Utility Law. However, upon closer examination of this subclause we realize that it must undergo substantial revision. We shall do this by way of a separate rulemaking to avoid the delay caused by republishing this rulemaking.

*Section 57.21 — Demand meter testing.* Rule 11, D.(1), now promulgated as § 57.21, included a test schedule for block interval demand meters. Because this test schedule was inadvertently omitted when § 57.21 was promulgated, we shall add it as a new subsection (e)(5).

*Section 57.25 — Facilities for testing meters and instruments.* Penn Power suggests that we further amend § 57.25(f), related to fees for testing appliances of public utilities, to recognize that the instruments used by utilities vary in the number of standards used and that this results in a variance in the number of test points required. We have made this amendment and, in addition, we have made minor changes to some of the dollar amounts, included more detail in some categories and deleted a redundant category.

Section 204 of the CDL (45 Pa. Code § 1204) requires notice and opportunity for written comment prior to final promulgation of a regulation. However, notice of the original fee changes was published at 12 Pa. B. 1771. In addition, Penn Power filed the only comment regarding meter testing fees. Finally, the refinements mentioned above do not substantially change § 57.25(f). For these reasons we find the procedures at 45 Pa. Code § 1204 to be impractical, unnecessary and not in the public interest. Therefore, this section, as it appears in Annex A, shall be made final.

*Section 57.26 — Construction and maintenance of facilities.* Five comments suggest that the reference to the "1961 Edition of the National Electric Safety Code (Code) be changed to the "current" edition, or words of similar effect, because the Code is revised every two years. As expedient as adopting this suggestion may seem, doing so would amount to an unlawful delegation of our duty to promulgate regulations governing public utilities to the editors of the Code. Therefore, we must maintain the reference to the 1981 edition of the Code and we shall review and adopt future editions of the Code if they meet our approval. In response to UGI's concern that adoption of the Code might require costly retrofitting of existing equipment, we note that application of the Code standards will be applied prospectively, not retroactively.

*Section 57.48 — Annual transmission line report.* Met-Ed recommends that subsection (b)(7), which requires the inclusion of the actual recorded costs for any HV transmission line completed since the filing of the previous report, be clarified so that the actual costs as recorded on the utility's property records is required instead of the "actual recorded costs." Penelec requests that the requirement be modified to include the actual cost or the latest estimate. We recognize that such occurrences as billing lag and accounting lag prevent the availability of detailed actual costs immediately after a line is constructed. We shall adopt Penelec's recommendation and require that any estimates furnished be so marked and updated at the next annual filing.

*Section 57.49 — Annual capacity planning report; § 57.50 — Forms.* We have made minor changes to both sections for the purpose of clarifying the reporting requirements and the related forms. The information required by Form A (energy demand and number of customers) is too voluminous to fit on one form. Therefore, we have designated Form A for inclusion of energy demand and have added Form A-1 for inclusion of the number of customers. Minor revisions have been made to the symbol codes used in Forms 138-E and 138-F. Finally, minor changes have been made in paragraph (8) of §§ 57.59 and 57.50 and in corresponding Form 138-H so that the required information is filed in a manner conforming to our staff's use of the information.

We shall adopt Penn Power's suggestion that the introductory paragraph to § 57.49 be amended so that it is clear that only public utilities generating electric energy to serve customer demand *in Pennsylvania* be required to file a report.

*Section 57.52 — Emergency load control and energy conservation by electric utilities.* The commenting utilities point out that it will be impossible

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to exempt the customers listed in subsection (b)(4) from mandatory curtailment. Our intent is that the term "mandatory curtailment" refer only to emergency procedures where the use of electric power is reduced, and not to voltage reductions or load shedding. However, we agree that implementation may be impossible and we have deleted subsection (b)(4).

*Siting Regulations*

The balance of this order discusses changes to the Siting Regulations. Because we introduced new sections between existing sections of the Regulations, we were required to designate the new sections by the addition of letter suffixes to the proceeding section number, in this case, § 57.76. As pointed out in the comments, this resulted in a confusing numbering format which would have led to improper citations and other problems. We have remedied this by eliminating §§ 57.76a, 57.76b and 57.76c and including the same information as subsections to existing sections, thereby retaining the original section numbers. This change further clarifies the Siting Regulations because the new information fits more logically into the new locations. The changes are as follows: § 57.76a becomes § 57.75(i); § 57.76b becomes § 57.72(d); and § 57.76c becomes § 57.72(e).

*Section 57.1 — Definitions.* Some comments asserted that the requirement that an alternate route include not more than 25% of the right-of-way of the proposed route is unduly burdensome. We disagree. If the requirement can not be met owing to an unavoidable circumstance, the presiding officer is able to entertain a request that an applicant be exempt from meeting the requirement.

All commentors request that we change the definition of "existing transmission line right of way" so that it includes a right-of-way of sufficient width upon which is located at least one line sited by us after May 20, 1978. The adoption of wording excluding such a right-of-way was inadvertant. We shall adopt PP&L's suggested change.

We shall delete the phrase "and less than 100,001 volts" from the definition of "transmission line" so that this term continues to mean an overhead electric supply line with a design voltage greater than 35,000 volts.

*Section 57.72 — Form and Content Application.* As submitted for publication in the *Pennsylvania Bulletin*, the reference to transmission line rights-of-way in subsection (c)(4) referred to HV line rights-of-way, but when published it was inadvertantly changed to transmission line rights-of-way. We have made the correction. At the same time, we have clarified this paragraph so that it is clear that an application must include a list of names of those owning property within the proposed right-of-way.

As discussed above, § 57.76b has been redesignated as § 57.72(d) and the previous subsections and paragraphs have been redesignated as paragraphs and subparagraphs. Comments were filed with respect to what are now § 57.72(d)(1)(iv) and § 57.72 (d)(1)(v). Subparagraph (iv) does not, but should, apply if the voltage of an HV line is increased. Also, subparagraph (v) does not, but should, apply if an HV line is rebuilt at the same voltage level. We shall change these two subparagraphs to cover these contingencies. However, we caution those utilities whose comments indicate the belief that an increase in the voltage of an existing HV line can not result in a substantial alteration of the right-of-way. Our regulations do not prohibit us from rejecting a letter of notification and directing that a siting application be filed if we feel that the change in voltage, and the corresponding change in electromagnetic and electrostatic fields, is significant enough to result in a substantial alteration of right-of-way.

At PP&L's request we shall change what is now § 57.72(d)(4)(iii) so it reflects the fact that lines less than two miles in length under § 57.72(d)(1)(vi) are not subject to the qualification regarding the character of an existing right-of-way. Also, we shall change what was § 57.76(b)(d)(5) to § 57.72(d)(5) so that this provision, which sets forth what the Commission must do after a letter of notification is filed, is separated from the list of items which a letter of notification must contain.

*Section 57.74 — Filing and service of application and notice of filing.* PP&L urges us to eliminate the property owner notice requirement and, instead, require that the applicant demonstrate its efforts to inform the public about the project after which we can direct that additional notice be given if we believe it necessary under the circumstances of a given application. We prefer a system which gives notice to all property owners whose property is required for the construction and location of the proposed route. We encourage applicants to take extra steps to bring about greater public awareness of and participation in the siting process. However, we have determined that the minimum notice requirement is notice to all affected property owners and, therefore, we shall not make the requested change.

*Section 57.75 — Hearing and notice.* The Pennsylvania Department of Environmental Resources has requested that we add the item "Scenic rivers" to the list appearing in § 57.75(e)(3). Since this will enhance DER's implementation of the Scenic Rivers Act, we shall make the requested addition. Also, we have corrected a typographical error in § 57.75(1)(iii) designated as § 57.76a(b) when originally published in the *Pennsylvania Bulletin*.

*Section 57.77 — Effective date.* To avoid any possible retroactive application of the revised regulations we shall change the effective date of the regulations from May 20, 1978 to January 8, 1983.

Under sections 331, 501, 504 and 1501 of the Public Utility Code, 66 Pa. C. S. §§ 331, 501, 504 and 1501, § 201 *et seq.* of the act of July 31, 1968 (P. L. 769, No. 240) (45 P. S. § 1701 and the regulations thereunder at 1 Pa. Code §§ 7.1 and 7.2, we conclude that the proposed amendment to 52 Pa. Code Chapter 57 should become effective on January 8, 1983; *Therefore*,

*It is Ordered*:

1. That 52 Pa. Code Chapter 57 be amended by amending §§ 57.16, 57.26, 57.42, 57.44, 57.47, 57.51, and 57.76 and deleting §§ 57.73, 57.92, and 57.93 to read as set forth at 12 Pa. B. 1771 (June 5, 1982) and by adding §§ 57.49 and 57.50 and amending §§ 57.1, 57.14, 57.19, 57.21, 57.25, 57.45, 57.48, 57.52, 57.72, 57.74, 57.75 and 57.77 to read as set forth in Annex A.

2. That the Secretary shall submit this Order to the Office of the Attorney General and General Counsel for approval as to legality.

3. That the Secretary shall duly certify this order and deposit the same with the Legislative Reference Bureau for publication in the *Pennsylvania Bulletin*.

4. That a copy of this order be served upon all jurisdictional electric utilities.

5. That this proceeding shall be

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closed upon publication of this order in the *Pennsylvania Bulletin*.

*By the Commission*

JERRY RICH,
*Secretary*

Fiscal Note: Fiscal Note L-820071 remains valid for the final adoption of the subject regulation.

Annex A

## TITLE 52. PUBLIC UTILITIES

## PART I. PUBLIC UTILITY COMMISSION

### Subpart C. FIXED SERVICE UTILITIES

## CHPATER 57. ELECTRIC SERVICE

### Subchapter A. GENERAL PROVISIONS

**§ 57.1. Definitions.**

The following words and terms, when used in this chapter shall have the following meanings, unless the context clearly indicates otherwise:

*Alternate route or alternative route* — A reasonable right-of-way which includes not more than 25% of the right-of-way of the applicant's proposed route.

*Commence construction* — To begin clearing or disturbing the land or the first act in erecting thereon any artificial structure, but does not include action necessary for the purpose of gathering survey, geological, environmental, or similar data.

*Customer* — Any party supplied with electric service by a public utility.

*Customer's installation* — Wiring and equipment on the premises of a customer, and all poles, wires or cables, and other facilities necessary to bring the terminus of the wiring of a customer to a location where it may be connected to the service line.

*Electric supply line* — The wires or cables, with the necessary supporting or containing structures and appurtenances, used on connection with any overhead or underground system of a public utility, providing electric power, located on a public highway or utility right-of-way and used to transmit or distribute electric energy.

*Eminent domain application* — An application filed with the Commission by a public utility for a certificate of public convenience for approval of the exercise of the power of eminent do-

*Existing transmission line right-of-way* — A right-of-way of sufficient width to accommodate two or more transmission lines on May 20, 1978 and on which at least one transmission line was erected as of May 20, 1978, or a right-of-way of sufficient width to accommodate two or more lines for which siting approval was received and on which at least one line has been constructed.

*HV transmission line* — *HV line* — An overhead electric supply line with a design voltage greater than 100,000 volts.

*Line extension* — An addition to the public utility electric supply line necessary to serve the premises of a customer which addition is so located that it cannot be supplied by means of a service line from the existing electric supply line.

*Proposed route* — The right-of-way on which the applicant desires to construct an HV transmission line.

*Public utility* — Persons or corporations in this Commonwealth owning or operating equipment or facilities for generating, transmitting, distributing, or furnishing electricity for the production of light, heat, or power to or for the public compensation. The term does not include either of the following:

(i) Any person or corporation not otherwise a public utility who or which furnishes service only to himself or itself.

(ii) Any *bona fide* cooperative association which furnishes service only to its stockholders or members on a nonprofit basis.

*Service line* — The wires or cables and appurtenances which connect the electric supply line of the public utility with the customer's installation and which comply with either of the following:

(i) If overhead-open-wire or cable-construction, the span, normally 100 feet, extending to a suitable support provided by the customer; or

(ii) If the electric supply line is of underground construction, the underground facilities extending to but not exceeding 18 inches inside the property line of the customer.

*Service terminal* — The point at which the service lines of the public

*Siting application* — ... filed with the ... utility under § ... cations.

*Transmission line* — ... electric supply line ... age greater than ...

*Transmission right* — ... right enjoyed ... other subject ... which arises ...

(i) a lease

(ii) an easement

(iii) a right to use or

(iv) an option to ... possession or

(v) ownership in fee or any lesser estate for the purpose of ... maintaining a transmission line.

§ 57.14. Service voltage.

(a) *Standard* ... utility shall adopt a ... service voltage ... served by the public ... file with the Commission ... standard service volt... as part of its official ... suitability and adequate ... ard nominal service ... ages adopted may ... any time by the Commission.

(b) *Allowable ... marily lighting* ... primarily for lighting ... lowable variation in ... at the service termination ... er shall not exceed, for ... than one minute in each ... above or below the ... service voltage and ... from minimum to ma... during normal system ...

(c) *Allowable volta... marily power*. For ... primarily for power ... lowable variation in ... at the service termin... er shall not exceed, f... than one minute in e... above or below the ... service voltage dur... operation.

(d) *Variation in ... limits*

(1) Any public ... proved by the ... service under ...

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# Township of Upper Moreland

117 Park Avenue
WILLOW GROVE, MONTGOMERY COUNTY, PENNSYLVANIA 19090
Telephone (215) 659-3100
Fax (215) 659-7363



*COMMISSIONERS*
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WILLIAM C. SEIBERLICH, JR.
Vice President
RICHARD D. BOOTH
GEORGE T. DEPMAN
IAN A. McGAIN
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*OFFICIALS*
BRIAN L. MOOK, Township Manager
DAVID A. DODIES, Asst. Township Manager
ROBERT D. WALTER, Treasurer
RAYMOND JENKINS, Solicitor
GEORGE B. DITTER, Solicitor


December 27, 1990


DUPLICATE RECORD.
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TO COMMONWEALTH COURT

RECEIVED
JAN 4 1991
SECRETARY'S OFFICE
Public Utility Commission


Pennsylvania Public Utility Commission
1302 State Office Building
Philadelphia, PA 19130

Gentlemen: PUC Docket # A 110550 - F055

The Board of Commissioners of Upper Moreland Township would like to have you reconsider your decision in regard to the matter referred to by Docket # A 110550 - F055. We understand that this case involves possible siting of a 230,000 volt power line through our community on into Bucks County by Philadelphia Electric Company.

A representative of Parents Against an Unsafe Environment (PAUSE) spoke to us last week and, although we can neither confirm nor deny any of their allegations, we do feel that they raised enough points to substantiate a request on the part of the Board of Commissioners that the PUC reconsider its decision. If the possibility exists that anyone's health could be threatened by emissions from this line, then you certainly should re-examine your decision.

The Board of Commissioners of Upper Moreland Township would like its name added to other municipalities in Bucks County which have petitioned you for reconsideration, in the hope that your Commission will look favorably upon this request.

If you have any questions regarding Upper Moreland's position on this matter, please feel free to contact me at 215-659-3100.


DOCKETED
JAN 10 1991


Very truly yours,

Brian L. Mook
Township Manager


DOCUMENT FOLDER


BLM/dm
cc: Board of Commissioners

BUCKS COUNTY
# Courier Times

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**Power line study**

# *EPA report demands new public hearings*

An Environmental Protection Agency report scheduled to be released this week apparently supports what opponents of a proposed 230,000-volt power line in Southampton, Northampton and Middletown have thought all along: Living next to one of these things might not be safe.

The study links electromagnetic fields to leukemia and brain cancer in children. While a definitive conclusion has not been reached, the study is sufficient reason to exercise extreme caution and reopen public hearings before the Public Utility Commission.

The proposed power line, set to run along Conrail's Trenton cut-off rail line, is needed to accommodate expected growth in parts of Bucks and Montgomery counties, according to PECO. But opponents say the possible health risks are too dangerous and have formed Parents Against an Unsafe Environment (PAUSE) to challenge the energy giant. Also, the state Legislature has begun looking at the effects of electromagnetic fields.

From the beginning, PECO has been less than the model good neighbor. A vague letter sent to municipalities in late 1989 did not sufficiently address the potential dangers of electromagnetic fields. In late August, PECO representatives told residents they would not halt construction nor would they consider alterations to diminish possible health risks.

But data now exist that lead one to ask, "What did PECO representatives know about electromagnetic fields, when did they know it, and why were they apparently unwilling to share it?" The company's action, or lack of action, raises suspicions. Right or wrong, the public's perception of PECO isn't very positive.

In light of the new findings, the PUC, which approved the line last year, should reopen public hearings. Taking another look at the issue makes sense. Residents will be able to present their findings and PECO can clear its name by coming clean with everyone.

**The next divisive issue**

# Super

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THE COURIER TIMES, BUCKS COUNTY, PA., FRIDAY, DECEMBER 14, 1990

Friday, December 14, 1990 35¢

# Cancer, electromagnetic fields linked

By Paul Raeburn
AP Science Editor

An Environmental Protection Agency report linking electromagnetic fields to leukemia and brain cancer in children will be released next week after being held up by the White House science adviser, the EPA said yesterday.

Some EPA scientists said the White House was wrong to delay the report. But the White House science adviser's office told the agency it was concerned the report would alarm the public, EPA officials said.

Similar reservations were expressed by Assistant Secretary of Health James Mason, the EPA officials said.

"They were concerned not about the accuracy of the report," said Robert McGaughy, who supervised the report's preparation. "They were concerned about how people would react to the news. There is a concern that people will take too seriously the suggestions that there may be some connection with cancer."

Neither White House science adviser D. Allan Bromley nor Mason were available for interviews yesterday, their offices said.

The report looked at all kinds of electromagnetic fields, from those produced by high-power electrical transmission lines to those produced by household appliances.

Virtually everyone is exposed to such fields every day.

Epidemiological, or statistical, studies have linked residential exposures to childhood cancer and occupational exposures to cancer in adults,

Please see EPA 8A

# EPA data links cancer, electromagnetic fields

EPA from Page 1A

said David Savitz of the University of North Carolina in Chapel Hill, the author of one of the most important of those studies.

Laboratory studies have suggested that living cells can respond to electromagnetic fields, and researchers have hypotheses as to why the fields might theoretically cause cancer, he said.

"There are credible scientific suggestions of adverse health effects from these exposures, but the overall body of evidence is not conclusive," said Savitz.

The EPA report is a review of all existing studies on electromagnetic fields and cancer. A draft prepared last summer concluded that the studies "show a consistent pattern of response which suggests, but does not prove, a causal link" between household power distribution systems and certain cancers in children.

The children's cancers were leukemia, brain cancer and lymphoma, the report said.

The draft has been revised once, but "our current conclusions are very similar," McGaughy said.

David Bayliss, one of the authors, said he was frustrated by the delay in releasing the report. He said it had been scheduled to go out Nov. 27.

"What is the use of having an Environmental Protection Agency if you're going to withhold information from the public?" Bayliss said. "I thought the EPA was for letting people know about health problems, or possible health problems."

McGaughy said the report was delayed because of questions raised by Bromley, and that Mason later expressed some of the same objections.

McGaughy said the questions were raised by Bromley at a meeting McGaughy and other EPA officials attended in Bromley's office on Nov. 26, the day before the scheduled release.

The meeting with Mason took place Dec. 6, McGaughy said.

Erich Bretthauer, the EPA's assistant administrator for research and development, said it was natural for Bromley and Mason to be involved, because an interagency federal committee that they oversee is also studying electromagnetic fields and health hazards.

"It is an important area. Many people have concerns about it, including Dr. Bromley's office and Dr. Mason's office," Bretthauer said. The report will be released next week, he said.

Bretthauer said Bromley and Mason disagreed with the EPA over the nuances of the epidemiological studies considered in the report. "I don't think they see the data the way we do," Bretthauer said.

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# PHILADELPHIA ELECTRIC COMPANY

LEGAL DEPARTMENT


2301 MARKET STREET, BOX 8699
PHILADELPHIA, PA 19101
(215) 841-5544 FAX: 568-3389

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Mary R. McFall
Assistant General Counsel


January 10, 1991


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JAN 10 1991
SECRETARY'S OFFICE
Public Utility Commission


VIA FEDERAL EXPRESS

Jerry Rich, Secretary
Pennsylvania Public Utility Commission
Room G-18, North Office Building
Harrisburg, PA 17120

Re: Letter of Notification of Philadelphia Electric Company
Re: Proposed 230 KV Woodbourne to Heaton Transmission
Line, Docket No. A-110550F055

Dear Secretary Rich:

I have enclosed for filing in the subject matter an original and three copies of Philadelphia Electric Company's reply to the statement filed by the Office of Consumer Advocate in the subject proceeding.

Sincerely,

Donald Blanken

Donald Blanken

DB/lae
Enclosures
cc: Patricia Burkett, Esquire
Service List

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA PUBLIC UTILITY COMMISSION
P. O. BOX 3265, HARRISBURG, Pa. 17120

February 20, 1991

DUPLICATE RECORD.
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT.

IN REPLY PLEASE
REFER TO OUR FILE

Charles O. Marte, Jr.
Solicitor, Lower Southampton Twp.
344 South Bellevue Avenue
Langhorne, PA 19047

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MAR 05 1991

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1991
OFFICE
Commission

In Re: A-110550, F. 055

Dear Mr. Marte:

This is in reply to your letter of February 5, 1991 commenting on the construction of the Woodbourne-Heaton 230 KV transmission line by Philadelphia Electric Co.

The interest expressed by residents in the area has come to the attention of Chairman Smith and the Commissioners. In order not to compromise the Chairman and Commissioners' decision on this very important issue, I have been requested to acknowledge your letter.

The Commission's technical staff and Law Bureau will prepare a recommendation for consideration by the Commission in Public Meeting. Your letter, on behalf of Township residents, will be included in our file under the petition for reconsideration.

Sincerely,

Conrad J. Six, Director
Bureau of CEEP

ccs: Chairman
Commissioners
Director Alford
Law Bureau

CJS:llb

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FOLDER

RECEIVED
FEB 0 8 1991
Chairman Smith's Office

MARTE AND TOADVINE
ATTORNEYS AT LAW
344 SOUTH BELLEVUE AVENUE
LANGHORNE, PENNSYLVANIA 19047

CHARLES O. MARTE, JR.
ALLEN W. TOADVINE

757-0344
AREA CODE 215
FAX: (215) 757-3048

February 5, 1991

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A-110550 F.055
DUPLICATE RECORD:
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

William H. Smith
Public Utility Commission
North Office Building
P.o. Box 3265
Harrisburg, PA 17120

RECEIVED
FEB 21 1991
SECRETARY'S OFFICE
Public Utility Commission

Re: Woodbourne - Heaton 230 KV Transmission Line

Dear Mr. Smith:

I have been requested by the Lower Southampton Township Board of Supervisors of Bucks County to contact the Commissioners of the Public Utility Commission and advise them of Lower Southampton Township's concern over the continuation of construction of a 230,000 volt power line by the Philadelphia Electric Company from Philadelphia Electric's Heaton Road Substation in Willow Grove to Woodbourne Road in Oxford Valley. Lower Southampton Township residents are directly affected by this new line which runs through the Township.

The Lower Southampton Township Board of Supervisors is extremely concerned that construction, pending a decision by the Public Utilities Commission, is continuing. Our concern relates to the fact that this continued construction will prejudice the public interest. We feel that prejudice may be caused because money has been spent by PECO for the construction and that may somehow weigh in the decision which is ultimately rendered at the hearing before your Commission. If it does not weigh as a fact in the decision and the Public Utility Commission denies permission for this new line, then this will be a useless expenditure of utility funds which will cause an increase in rates for all PECO residents, including the citizens of Lower Southampton Township. In any event, it seems to be a bad public policy to allow construction to continue on this line pending the hearing in this matter.

FOLDER

Although the Township received a Letter of Notification in reference to this line in November of 1989, the Township was not informed that notice was not being given to the individual affected residents, and, therefore, the Township had no reason to suppose that the residents could not protect their own interest in this matter. However, as you are aware, notice was not given to the individual affected citizens since it is not required under the PUC regulations. Further, that original Letter of Notification conveyed the impression that this was merely a

reconstruction of an existing 130,000 volt transmission line rather than the building of a new 230,000 volt line.

Under normal circumstances, the Township thru its zoning and police powers would have the right to control uses and activities in the Township. However, due to State Statutes, the Public Utility Commission has exclusive jurisdiction in this matter and the Commission will hopefully rule on the substance of the public interest in regards to this new transmission line currently be constructed by PECO. The Township is encouraged that the PUC is going to act on the substance and not just the procedure in this matter since they are concerned about the effect of this new high voltage line on Township residents.

On behalf of the Board of Supervisors, I am requesting that construction be halted on the PECO transmission line pending the outcome of a substantive hearing to determine the effect on the neighboring landowners caused by this new power line.

Thank you for your continuing concern, and hopefully, support in this matter.

Very truly yours,

Charles O. Marte, Jr.
Solicitor, Lower Southampton Township

COM/emt
cc: Kathleen R. Goldhahn

ORIGINAL

DUPLICATE RECORD!
ORIGINAL CERTIFIED
TO COMMONWEALTH COURT

BEFORE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

JAN 18 1991

IN RE: Letter of Notification of Philadelphia Electric Company relative to reconductoring and rebuilding of the existing 138 kV line to operate as a Woodbourne-Heaton 230 kV line, in Montgomery and Bucks Counties.

Docket No. A-110550F055

RECEIVED
JAN 10 1991

REPLY OF PHILADELPHIA ELECTRIC COMPANY TO NOTICE OF INTERVENTION FILED FOR OFFICE OF CONSUMER ADVOCATE

Philadelphia Electric Company (hereinafter "PECO") replies to the Notice of Intervention and attached Statement in Support filed on January 3, 1991, on behalf of the Office of Consumer Advocate (hereinafter "OCA"), in the above- captioned matter as follows:

1. There is no legal basis for reopening the proceeding.

OCA takes the position "that the Letter of Notification procedure utilized by the Commission in this case is inadequate in light of the concerns raised by Petitioners and contends that the Commission should order a hearing." OCA states that the reason for its position is that had the application procedure been followed, a hearing would have been provided and "general notice" of such hearing by newspaper publication would have been given pursuant to 52 PA. Code § 57.75. The thrust of OCA's

argument is that general notice via newspaper publication is to be preferred over actual notice to all municipalities through which the line passes. OCA ignores the fact that actual notice consisting of the entire Letter of Notification was sent to three different public officials in each township; the Township Manger, the Chairman of the Board of Supervisors and the Chairman of the Planning Commission. Such notice was served on these individuals in Lower Southampton Township, Upper Southampton Township, Middletown Township, Upper Moreland Township, Lower Moreland Township, and Northampton Township - 18 individual notices sent to the aforementioned township officials. In addition, copies of the Letter of Notification were sent to 4 different public officials in the Borough of Langhorne - the Mayor, Council President, Borough Secretary and Chairperson of the Planning Commission. In addition, public officials in the Counties of Bucks and Montgomery were served with copies of the Letter of Notification; the Chairman of the Board of County Commissioners and the Director or Chairman of each planning commission - a total of 4 public officials. In addition, the Secretary of the Pennsylvania Department of Environmental Resources was served with the Letter of Notification, as well as the Secretary of the Department of Transportation, Chairperson of the Pennsylvania Historical and Museum Commission and an official of the Pennsylvania Department of Property and Supplies - 4 state officials in all. A total of 29 different public officials were served with a copy of the Letter of Notification. Not one of

3. The Commission has jurisdiction over the safety of electric transmission lines and adequately considered all elements of safety in approving PECO's Letter of Notification.

The second argument (page 3) in OCA's statement questions the expertise of the Commission to determine whether or not the proposed transmission line is such a hazard to the public health that it should not be constructed as proposed. That this Commission has complete jurisdiction over the safety of electric transmission lines is beyond cavil. 66 PA. CSA Sec. 1501, 1505. The portion of the Commission's Order quoted in OCA's statement on page 4 is eloquent evidence of the Commission's expertise and awareness of the electromagnetic field issue.

> "Our regulations do not prohibit us from rejecting a letter of notification and directing that a siting application be filed if we feel that the change in voltage, and the corresponding change in electromagnetic and electrostatic fields, is significant enough to result in a substantial alteration of right-of-way."

Obviously, the Commission considered the very concerns of the public which OCA argues now should be considered even though OCA states it has no position on this issue. The recent decision of the Public Service Commission of New Jersey (115 PUR 4th 542, July 12, 1990) completely answers OCA's argument on the issue of reopening the record to allow the public to voice its concern over the electromagnetic field issue (copy of decision attached).

It is respectfully submitted that OCA has shown no basis for

reopening the record in this proceeding to conduct hearings regarding the concerns of Petitioners.

Respectfully submitted,

PHILADELPHIA ELECTRIC COMPANY

Donald Blanken

Donald Blanken, Esquire
Counsel for
PHILADELPHIA ELECTRIC COMPANY
2301 Market Street
Philadelphia, PA 19101

CERTIFICATE OF SERVICE

I hereby certify that I have this 10th day of January, 1991, served a copy of the foregoing document upon the parties of record in this proceeding in accordance with the requirements of 52 PA. Code § 1.54 (relating to service by a participant), as follows:

SERVICE BY FIST CLASS MAIL

Robert J. Sugarman, Esquire
Sugarman & Associates
16th Floor, City Place
101 North Broad Street
Philadelphia, PA 19107

Tanya J. McCloskey, Esquire
Assistant Consumer Advocate
Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120

Donald Blanken

DONALD BLANKEN, ESQUIRE
Counsel for
PHILADELPHIA ELECTRIC COMPANY

of current management, the Court finds that argument to be disingenuous. The REA's motion to examine management about the transfer was filed on June 14, 1990, and granted on July 20, 1990. An article on the issue was in the newspaper shortly thereafter. It is difficult for the Court to imagine that CFC only recently learned of the transfer and if the transfer did deeply concern CFC, why it was not mentioned in the exhaustive testimony of its witness which was filed on July 13, 1990.

[15]On the other hand, it appears that PSCo filed its support of the motion in fulfillment of its warning that it would do so if Colorado-Ute did not accept its subject offer. The Court does not countenance the tactical use of a motion as significant as a motion to appoint a trustee as retribution for the debtor's failure to carry out a particular creditor's demands.

[16]The trustee may need to hire out-of-state counsel due to the current involvement in this case of most of the local bankruptcy firms with the staff and ability to represent the trustee.

## Re Jersey Central Power and Light Company

Docket No. EE89020154

New Jersey Board of Public Utilities
July 12, 1990

ORDER declining to rehear a decision authorizing construction of a 230-kilovolt electric transmission line, despite recent questions as to health hazards associated with concomitant electromagnetic fields.

1. PROCEDURE, § 32 — Rehearing — Board authority — Limits.

[N.J.] The board may extend, revoke, modify, or order rehearing of any of its decisions at any time, limited only by considerations of reasonableness and equity and a need for the parties involved to have a sense of finality about board proceedings.
p. 546.

2. PROCEDURE, § 32 — Rehearing — Timing — Prior opportunity to intervene as a factor.

[N.J.] Where a municipality had had adequate notice of an electric utility's plan to construct a high-voltage transmission line, but neither commented nor intervened in the certificate proceeding, the city's petition to rehear the decision authorizing construction of the line was denied, as the petition was not filed until the line was almost complete and ready to be energized.
p. 546.

3. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Notice requirements.

[N.J.] Where an electric utility had provided adequate public notice of its intent, routing, and sizing for construction of a proposed high-voltage transmission line, it was found unnecessary for the utility also to be required to provide separate notice of specific health issues that might arise in association with electromagnetic fields surrounding the line.
p. 546.

4. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Electromagnetic fields — Health hazards.

[N.J.] Finding a continuing division of scientific opinion as to the health hazards presented by electromagnetic fields surrounding high-voltage electric transmission lines, the board declined to stay a decision authorizing construction of a transmission line, as the line was almost complete anyway, a need for the line's capacity had been demonstrated, and no present danger from the line was conclusively proven to exist.
p. 546.

5. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Electromagnetic fields — Guidelines.

[N.J.] The state of New Jersey has only guidelines for acceptable levels of electromagnetic radiation emissions from high-voltage electric transmission lines, but no formal, enforceable regulations on electromagnetic fields.
p. 547.

i. ELECTRICITY, § 7 — Authorization for transmission lines — Factors — Electromagnetic fields — "Prudent avoidance" standard.

[N.J.] Discussion of (1) the possibility of health hazards associated with electromagnetic fields surrounding high-voltage electric transmission lines, (2) the "California" approach to such hazards, which does not find electromagnetic field health hazards irrefutable, and (3) the "Colorado" approach, which relies on "prudent avoidance" of certain levels of radiation just in case health hazards are proven in the future; the board stated that it was likely to consider adoption of the "prudent avoidance" standard in the future as a matter of transmission line construction policy. p. 549.

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APPEARANCES: Wilentz, Goldman & Spitzer, by Sidney D. Weiss, Esq., Woodbridge, New Jersey, for Jersey Central Power & Light Company; Dasti & Murphy, by Jerry J. Dasti, Esq., Forked River, New Jersey, for the Township of Berkeley; John C. Sahradnik, Esq., Toms River, New Jersey, for the County of Ocean.

Before Weiner, President, and Barbour, commissioner.

By the BOARD:

On February 8, 1989, Jersey Central Power & Light Company (JCP&L or Company) filed a petition pursuant to *N.J.S.A.* 40:55D-19 requesting an order that the zoning ordinances and land use regulations of the Township of Berkeley (Berkeley) and the Borough of South Toms River, both in Ocean County (County), shall not apply to, among other things, the construction and operation of a 3.14 mile 230 KV line, together with supporting and appurtenant structures, beginning at a tap point on the Company's previously approved Whiting/Van Hiseville 230 KV line in Berkeley and from there continuing through Berkeley and the Borough of South Toms River to the JCP&L Manitou substation in Berkeley.[1]

A copy of the petition was served upon both of the affected municipalities. Neither of the municipalities filed an answer or appearance and it was determined that the matter could proceed as an uncontested case. Thereafter, following notice to both municipalities of the date and time, a hearing was held on March 30, 1989. No one appeared from either municipality to object to the relief being sought by JCP&L in this proceeding.

At hearing, JCP&L introduced and relied upon the testimony of five witnesses: (1) Edward R. Klasek, System Planning Engineer, testified concerning the need for the subject transmission line and concluded that the proposed construction would provide the required capacity increase for the area's 34,500 volt network, would provide more reliable service by maintaining adequate area 230,000 volt network supply voltage under the double circuit tower outages conditions, and would provide a margin of reserve capacity on the system to serve continuing load development in the area; (2) John J. O'Brien, Manager of Transmission Design, testified as to the route of the line, the type of structures to be installed, the construction techniques to be utilized and other particulars regarding the project. He further testified that calculations made to determine electric field strength at the edge of the right-of-way indicated that the maximum electric field strength would be well below the existing guidelines established by the New Jersey Department of Environmental Protection; (3) John J. Courtot, Manager of Substation Engineering, testified with regard to the work needed to expand the Manitou substation; (4) John J. Higgins, a Planning Consultant, testified concerning requirements of the land use regulations of the affected municipalities; and (5) Frederick J. Palmer, a Real Estate Consultant, testified that the project could be constructed and placed into operation with no substantial detriment to either the public good or to neighborhood property values.

After review of the entire record, the Board, in a Decision and Order dated June 7, 1989, determined that the proposed transmis-

sion line and substation addition were necessary for the service, convenience and welfare of the public. The Board therefore ordered that neither *N.J.S.A.* 40:55D-1, *et seq.*, nor any municipal ordinances or regulations made under authority thereof would apply to the subject project.[2]

By letter dated January 9, 1990, Berkeley, through its counsel, for the first time opposed the line on the grounds that its proximity to two senior citizen communities and the potential health hazards associated with power transmission lines were issues "probably not brought before the Board." Berkeley asked the Board to order JCP&L to cease construction of the line until such issues could be addressed.

By responding letter dated January 22, 1990, JCP&L notified the Board that the $3.6 million line had been virtually completed and would be energized within a matter of days. The Company indicated that it had met with the Berkeley administrator on January 25, 1989 and discussed the project prior to the filing of the Company's petition in this matter. The Company also provided the Board with a copy of a widely distributed memorandum from the administrator dated January 30, 1989, indicating that the route, of the proposed line was known to the Township. The Company's letter of January 22, 1990 goes on to state that Berkeley had been given prompt notice of all events occurring with regard to this matter and that no objection had been raised.

By letter also dated January 22, 1990, Berkeley argued that it had never received notice from JCP&L concerning potential health problems associated with electromagnetic fields emanating from high voltage electric transmission lines. The Township's primary concerns were related to cancer and to possible effects on cardiac pacemakers.

On January 23, 1990, Berkeley filed a formal motion with the Board requesting: (1) the reopening, rehearing, reargument and reconsideration of this matter pursuant to *N.J.S.A.* 48:2-40, *N.J.A.C.* 14:1-13.1, *et seq.* and 14:1-14.1, *et seq.* and (2) a stay of the Board's June 7, 1989 Order. Said motion was subsequently joined in by Ocean County and both movants requested oral argument.[3] By letter dated February 14, 1990, the Acting Public Advocate supported the motion and indicated that if said motion were to be granted, the Advocate would move to intervene.

By supplemental filing dated January 25, 1990, Berkeley supported its request for a cease and desist order by arguing that: (1) currently pending state and Federal legislation with respect to the effects of electromagnetic fields and public interest mandates a reconsideration of the Board's decision and (2) by agreeing to delay construction of its Aberdeen-Red Bank 230 KV line (Monmouth County) (Docket No. EE8812-1293), JCP&L has indicated that it is not certain of potential health consequences associated with the transmission line. Berkeley further stated that along with two citizens, it had filed a complaint in Superior Court seeking to permanently enjoin JCP&L from constructing and operating the line. *Mayor and Council of the Township of Berkeley, et al, v. Jersey Central Power & Light Company*, Superior Court of New Jersey, Chancery Div., Ocean County, Docket No. C-38-90[4]

The formal positions of the parties were set forth in various moving and responding papers and were further developed and supplemented during the course of oral argument before the Board.

In support of their motion, Berkeley and Ocean County argue that JCP&L was aware of the scientific studies conducted with regard to the health impacts associated with exposure to high voltage electric transmission lines and failed to disclose their existence to the Township and its residents. They further argue that said failure constitutes good cause for the reopening and reconsideration of the prior proceedings held before the Board.

It is the position of movants that, had the existence of such information been disclosed, concerns of local residents would have been expressed at the public hearing and further evidentiary hearings would have been requested. Accordingly, they contend that the notice provided by JCP&L was not adequate to protect the due process rights of the residents and that the potential negative impact on the health, safety and welfare of the public represents a substantial basis for the reopening and reconsideration of the Board's prior proceeding and

order.

Movants do not dispute that JCP&L had complied with the notification requirements set forth in *N.J.S.A.* 40:55D-19. Said statute provides in pertinent part:

> This act or any ordinance or regulation made under authority thereof, shall not apply to a development proposed by a public utility for installation in more than one municipality for the furnishing of service, if upon a petition of the public utility, the Board of Public Utility Commissioners shall after hearing, *of which any municipalities affected shall have notice,* decide the proposed installation of the development in question is reasonably necessary for the service, convenience or welfare of the public. (Emphasis added).

Rather, the gist of movants' argument is that JCP&L had an obligation to give specific notice of the controversy surrounding possible health hazards caused by electromagnetic fields. As stated by the County at pages 8-9 of its brief:

> . . . considering the sensitive nature of the issues in question (i.e., the potential health hazards posed to nearby residents by prolonged exposure to high voltage electric transmission lines), JCP&L should have gone further and disclosed to nearby residents the health issues posed by the construction of the Project, including JCP&L's knowledge of the existence of several studies linking human exposure to high voltage electric transmission lines with cancer and other serious adverse health effects.

Movants also argue that as electric service is currently provided in the Berkeley area, the subject line should not be energized until evidentiary hearings can be held to look into: (1) the adverse health impact alleged by movants as a result of electromagnetic fields emanating from high voltage transmission lines; and (2) those measures that could be implemented to reduce exposures to such fields. When asked by the Board at oral argument whether granting of the relief requested would require Board reevaluation of all similar transmission facilities, counsel for movants responded that such broad reevaluation might be required if the Board were to find adverse health effects to be associated with such transmission facilities (Transcript of oral argument, April 4, 1990, p. 32).

Movants further contend that they are entitled to emergent relief in the form of a stay of the Board's Order of June 7, 1989, thereby prohibiting JCP&L from placing the subject 230 KV Manitou-Whiting line in service.[5]

Movants have likened the criteria for obtaining such a stay to that necessary for the issuance of a preliminary injunction, the main purpose of which would be to allow deliberation and consideration of a case on its merits while maintaining the *status quo.*[6]

The arguments of JCP&L in opposition to the pending motion are as follows:

1. Notice provided to Berkeley exceeded the statutory requirement as set out in *N.J.S.A.* 40:55D-19 by informing Berkeley of the petitions to be subsequently filed with the Board and the Pinelands Commission. In addition, the Company met with Berkeley officials and provided them with detailed information, such as maps and drawings. Thus, proper notice, full disclosure of the subject matter, and ample opportunity to participate was provided to Berkeley. With regard to Berkeley's contention that JCP&L was obligated to notify Berkeley of possible health hazards, the Company argues that there is no legal authority for the proposition that a notice given pursuant to *N.J.S.A.* 40:55D-19 must include a disclosure of all potential issues that could be explored at a hearing regarding a utility installation;

2. Berkeley and Ocean County have no standing to bring the pending motion since they never entered appearances or participated as parties as required by *N.J.A.C.* 14:1-14.1(a).[7] Even if they had been parties, the Company argues that the motion should be barred as untimely;

3. Neither Berkeley nor Ocean County has offered any basis for the Board, on its own motion, to reopen the hearings. JCP&L argues that the movants have conceded that no relevant study establishes that electromagnetic fields cause hazardous health effects and that, if there

were to be a rehearing, the best case that could be made would be to suggest that adverse health effects may occur. Such speculation, according to JCP&L, would be insufficient to justify any change in the Board's prior approval. The Company further argues that the studies relied on by movants support neither the consideration of the development of specific field strength standards nor the adoption of a plan of "prudent avoidance" with regard to a line that has already been built. In addition, the Company noted that if a real, as opposed to a speculative, threat of harm were shown to exist with regard to electromagnetic fields, not only might the Board be required to reevaluate all similar facilities, but society as a whole would also have to evaluate a host of more commonplace sources of electromagnetic fields, e.g. household wiring and appliances (Transcript of oral argument, April 4, 1990, pp. 50, 56);

4. The movants' request for emergent relief should be denied as they have made no showing of irreparable harm, and have not established any proven health risk including any adverse affect on health sustaining equipment such as cardiac pacemakers;

5. The subject line has been approved by the Board and constructed in reliance upon that approval; and

6. Said line is not unique and is substantially the same as tens of thousands of miles of electric transmission lines located throughout the United States.

The issue of standing would appear to present a threshold question as to whether Berkeley and Ocean County may bring the instant motion. The Board is of the opinion, however, that this question need not be addressed.

[1] There can be no doubt that the Board has the authority, pursuant to *N.J.S.A.* 48:2-40 and *N.J.A.C.* 14:1-14.1(b), to order rehearing, reargument or reconsideration and to extend, revoke or modify a decision or order made by it, on its own motion, at any time. *Township of Deptford v. Woodbury Terrace Sewerage Corp.*, 54 N.J. 418, 255 A.2d 737 (1969). The exercise of such authority must, however, be tempered by considerations of fairness and reasonableness, including considerations as to timeliness. *N.J. Bell Tel. Co. v. Board of Public Utility Commissioners*, 12 N.J. 568 (1953); *Ruvoldt v. Nolan* 63 N.J. 171 (1973); *In re Trantino Parole Application*, 89 N.J. 347 (1982); *Matter of Hotel and Restaurant Employees and Bartenders*, 603 N.J.Super. 297 (App. Div. 1985). In addition, the Board is cognizant of the need for certainty and finality in connection with administrative decisions and orders. It is equally important, however, that such considerations not deprive the public of a forum in cases involving weighty and pressing public policy issues. We regard this matter to be such a case.

Therefore, the Board on its own motion, pursuant to *N.J.S.A.* 48:2-40 and *N.J.A.C.* 14:1-14.1(b), will consider the motion of Berkeley and Ocean County. Accordingly, there will be no need to further address any issues pertaining to standing, including the applicability, if any, of the Environmental Rights Act, *N.J.S.A.* 2A:35A-1, *et seq.* The Board further finds that its decision to consider, on its own motion, the pending motion will similarly render a ruling on the adequacy of notice unnecessary at this time.[3]

[2-4] The ultimate question to be addressed by the Board, therefore, is whether a substantial basis has been established to warrant the reopening and reconsideration of the Board's Decision and Order of June 7, 1989. If so, the Board must also address whether the scope of the proceeding would be limited solely to a review of the Manitou-Whiting 230 KV transmission line or expanded to allow a review of all transmission lines in New Jersey which are similar to the subject line in terms of capacity and purpose. After careful review and consideration of the record, however, including the extensive submissions of the parties related to the pending motion, the Board concludes that a reopening of this matter is not warranted.

The underlying argument of the movants is that electric and magnetic fields produced by high voltage electric transmission lines are a potential threat to the public health. However, movants do not seriously dispute that there is no conclusive proof that such fields, in fact, cause hazardous health effects. Indeed, all reports cited by the parties, such as those prepared by

the Office of Technology Assessment for the House Interior Subcommittee on Water and Power Resources (June 1989) and the California Public Utilities Commission (September 15, 1989), acknowledge the inconclusive nature of current research in the area of electromagnetic fields. For example, in its report to the California Legislature, the California Commission recommended that:

> California take no action at the present to regulate electric and magnetic fields around electric power facilities. Any such actions are premature given current scientific understanding of this public health issue. Too little is known presently to be able to determine where or what rules would provide useful protection. Existing research data are not sufficient for adequate accurate risk assessment. We do not know which components, if any, of electric power utility operations pose significant health hazards. Although biological effects are clearly established, the relationship of these effects to possible public health risks is not yet established.

Similarly, on July 1, 1987, the report of the Scientific Advisory Panel of the New York State Power Lines Project was submitted to the New York Public Service Commission. After concluding that its findings did not readily translate into concrete regulatory recommendations on width of right-of-way, line heights, or location of lines near homes, the Panel recommended further research in specific areas, administered ". . . by an agency, preferably federal, which is credible by virtue of being clearly independent of partisan influence."

The continuing uncertainties with respect to electromagnetic fields were further underscored in connection with the recent siting and construction of a transmission line in the State of Oregon. The Energy Facility Siting Council in Oregon asked the State Department of Energy to review new information on the human health effects from 60 Hertz electromagnetic fields from high voltage transmission lines. The Energy Department contracted a team of researchers from various fields to review the issue. The report, dated January 1990, and written by Energy Department staff, summarizes the individual comments of the Panel members. A review of those comments reveals the inability of the individual panel members to reach any definitive conclusions regarding potential health effects associated with electromagnetic fields. The only unanimous conclusion reached by the Panel as noted by the Energy Department staff in its report, was that ". . . uncertainties point to the crucial need for further research."

[5] The conclusions reached in the above cited scientific studies are consistent with information transmitted to this Board by the New Jersey Department of Environmental Protection (DEP) prior to the Board's June 7, 1989 Decision and Order in this docket. In response to a Board inquiry regarding the potential health effects of electromagnetic radiation emanating from high voltage transmission lines, former DEP Commissioner Christopher J. Daggett, by letter dated April 11, 1989, advised the Board that:

> At the present time, the Department of Environmental Protection does not have regulations governing exposure to electromagnetic radiation emissions from power lines. The Commission on Radiation Protection has, however, passed a resolution . . . which states that the electric field at the edge of the right-of-way of such transmission lines should be no higher than 3 kilovolts/meter. This is a guideline and is not, therefore, enforceable. To the best of our knowledge all transmission lines meet this guideline.
>
> The Commission on Radiation Protection is appointed by the Governor and is responsible for promulgating rules and regulations concerning radiation protection in New Jersey. The Commission has not amended its resolution regarding electric fields to include the magnetic fields associated with power lines because they feel that there is insufficient scientific evidence, at this time, to warrant issuing guidance or promulgating regulations.
>
> In the absence of specific regulations we would normally turn to the scientific research

community for advice and counsel. Here we find that, on this issue, knowledgeable opinion is divided. While many researchers have reported biological effects of electromagnetic radiation, no study has demonstrated statistically significant adverse health effects.

While this is a very active area of research involving the scientific community, the utilities and various regulatory bodies, we do not anticipate the publication of definitive results for at least several years.[9]

Recent case law dealing with electromagnetic fields provides no more support for movants' position than do the above cited scientific studies. The Colorado Public Service Commission, by Order dated December 20, 1989, approved an application of Public Service Company of Colorado to upgrade an existing 115 KV transmission line to 230 KV. In deciding this matter, which was the first in which health effects issues had been specifically raised by the parties in connection with a power project in that state, the Commission found:

> As a result of the evidence presented in the docket on health effects, we arrive at a summary finding that, as of this time, there are no known or apparent adverse health effects resulting from electric and magnetic fields from low level overhead power transmission lines. *In the Matter of Public Service Company of Colorado to have Upgrades in Douglas County,* Docket No. 89A-028E, at page 16.

In an opinion dated December 21, 1989, a hearing officer for the Public Service Commission of Maryland, after analysis of extensive medical testimony, recommended approval of a 500 KV transmission line. In doing so, she specifically found that a causal relationship had not been established between exposure to electromagnetic fields and adverse health effects and saw no reason why the line should not be built:

> The suggestion that construction of the line be delayed until scientists resolve the question at issue is likewise unrealistic. Adopting such a recommendation would require placing a similar moratorium on construction of virtually all transmission and distribution lines within the state. Clearly, such a drastic measure cannot be taken without proof that it is necessary. *In the Matter of the Application of Potomac Electric Power Company,* Case No. 7004, at page 82.

The Maryland Commission, by order dated May 1, 1990, adopted *in toto* the hearing officer's recommendations.

In *Zappavingra v. State of New York and Power Authority of New York,* New York Court of Claims, Claim No. 74085, September 27, 1989, the claimant, in an action seeking condemnation damages, modified his original application by withdrawing his allegation that electromagnetic fields in fact cause health hazards. Rather, he argued in his post-trial brief that "... based upon the present state of science and the attendant publicity emanating through the motion . . . buyers have 'fear' of health risks associated with these high voltage power lines." In rejecting the claim, the court stated at page 25:

> After reviewing all of the scientific testimony and the numerous reports, the court finds that claimant failed to sustain his burden of preponderating in the evidence on the issue that there is a reasonable basis for any fear that power lines cause health problems.

This Board takes very seriously its authority to require all public utilities to furnish safe, adequate and proper service. We have therefore carefully reviewed the scientific studies submitted to us and the case law cited by the parties. Were a present and known danger to the public shown to exist, this Board would not hesitate to take prompt remedial action. On the record before us, however, no known danger has been shown to exist. At most, the record reveals a degree of potential risk which cannot be quantified with any certainty.

There can be no doubt that society tolerates certain degrees of risk, including, but certainly not limited to: airplane and motor vehicle

travel; emission of certain pollutants into the air and water; treatment of food products with chemicals; and unavoidable side effects associated with the development of prescription drugs and other medical treatments. However, in tolerating these risks, society has, based upon existing knowledge, set standards beyond which the activity will pose a clear and unacceptable risk to human health and, therefore, should be restricted. In setting such standards, the crucial determination is the point at which the identifiable risk rises to a level which imposes upon society the duty to take protective action, notwithstanding possible inconvenience and disruption to normal daily life.

If there were in the record before us a demonstrated, immediate and quantifiable health risk our course of action would be clear: the Manitou-Whiting 230 KV transmission line would not be energized until all concerns had been adequately addressed. Moreover, if such a health hazard were shown to exist, we would very quickly initiate an evaluation of all similar transmission lines in the State.

However, as has been the case in those jurisdictions wherein extensive studies have been conducted, and/or contested proceedings held, there is nothing before this Board that demonstrates any quantifiable risks associated with electromagnetic fields emanating from high voltage electric transmission lines. The record further reflects, and the Board must so find, that the subject line meets the New Jersey guideline pertaining to electric fields. As previously noted in Commissioner Daggett's letter of April 11, 1989, the guideline for electric field strength at the edge of an electric transmission line right-of-way has been set at 3 kilovolt/meter by the Commission on Radiation Protection. With regard to the subject line, it has been established that the maximum electric field which will be attained directly under the line, has been computed to be 0.355 kilovolt/meter in the areas of the affected senior citizen communities. This electric field will be approximately six to seven times lower than those fields which affect the most sensitive documented cardiac pacemakers. Similarly, the maximum magnetic field to be produced in this area will be 1.4 milligauss, far below the level of 1,500 milligauss which represents the lowest documented field level that has affected pacemaker function. Accordingly, the Board must further find that the subject line poses no greater threat to public health than does any 230 KV line in the State.

In light of the lack of any showing in this proceeding of adverse health effects and in recognition of our prior findings regarding the need for this project, the Board can only conclude that there is no basis in the record for denying JCP&L the authority to energize the Manitou-Whiting 230 KV transmission line.

[1] In the absence of any definitive proof regarding adverse health effects, the Board has two options. We may either: (1) conclude, as did the California Commission, that there is not yet enough evidence to warrant any action and, therefore, not require any changes to the present procedures until results of ongoing and future research clearly indicate the presence and extent of any adverse health effects associated with high voltage electric transmission lines; or (2) conclude that there is some basis for concern and consider the adoption of a policy of "prudent avoidance" which has been defined by the Colorado Commission as ". . . the striking of a reasonable balance between avoiding potential harm and the attendant costs and risks." *In the Matter of Public Service Company of Colorado, supra.* at p. 17.

With regard to the implementation of the policy of "prudent avoidance", the Department of Engineering and Public Policy of Carnegie Mellon University has stated:

> ". . . suppose an individual or a regulator is concerned, thinks the evidence points toward the possibility of some risk, and feels that something should be done. In this case, they can try to exercise some prudence by keeping people out of fields when this can be done with modest amounts of money and trouble. However, in circumstances where the cost and problems associated with doing anything would be large, these people would argue that the prudent thing to do is wait until better information is available.

"Electric and Magnetic Fields from 60 Hertz

Electric Power: What do we know about possible health risks? (1989)", pp. 25-26.

The policy of "prudent avoidance" was actually implemented in the aforementioned Colorado decision. Therein, the Colorado Commission stated that ". . . steps to reduce exposure at reasonable or modest cost . . . would include the use of reverse phasing on the line, higher ground clearances, and larger conductors than otherwise necessary . . . ." *In the Matter of Public Service Company of Colorado, supra,* at p. 17. In approving the request to upgrade the system, the Commission also noted that:

> Public Service has agreed to forego an interim 115/230 KV configuration and construct a 230/230 KV configuration as well as using steel poles in lieu of lattice towers. Public Service has also indicated that the ground clearance for the upgraded line is more than required by National Electric Code requirements of the line and that it will also use larger conductors than necessary. These proposals by Public Service will lower fields significantly, reduce noise, and thereby constitute a reasonable implementation of prudent avoidance. *Id.*

The Colorado Commission also directed the company to examine the possibility of locating its poles at a greater distance from residential properties. The Commission further held that "prudent avoidance" meant that the company ". . . should quantify and continue its support of industry research in this area and should begin to develop in-house capability to survey and measure electromagnetic fields." *Id.*

With regard to "prudent avoidance", there appears to be a consensus that such policy should be limited to matters involving the construction of new facilities or the proposed upgrading of an existing line, as was the case in the matter before the Colorado Commission. A clear statement of this position appears in the aforementioned publication of Carnegie Mellon University at page 27:

> State regulators who wish to exercise prudence about the exposures that people receive from power lines should, until more is known, limit their concern to new facilities. This is because even under the most pessimistic assumptions it is hard to justify the costs of modifying old facilities. Regulators who want to exercise prudence should site new facilities so as to keep people out of fields, but only up to some practical limit. Spending amounts as high as a few thousand dollars to avoid exposing someone might be justified. Much larger expenditures can almost certainly not be justified.

The Board may well have an opportunity to consider the application of "prudent avoidance" to new construction within the context of the pending contested matter involving JCP&L's proposed 230 KV transmission line project in Monmouth County. *In the Matter of the Jersey Central Power & Light Company Transmission Line Application,* BPU Docket No. EE88121293, OAL Docket No. PUC02022-89.

Based upon the record in this matter, however, the Board can only conclude that the subject line, was substantially constructed as of the date of Berkeley's motion and that said construction was based upon a determination as to the need for the line which was supported by a full record and appropriate findings. That determination remains valid as the need for this line still exists.

Based upon the foregoing and after careful review of the entire record in this matter, the Board *HEREBY ORDERS* that the motion of the Township of Berkeley and Ocean County for the reopening, rehearing, reargument and reconsideration of this matter be and is *DENIED.*

Notwithstanding our conclusions that this line is fully constructed and should be energized, and that the motion of Berkeley and Ocean County should be denied, the Board will provide the parties with a forum in which to explore the potential application of the policy of "prudent avoidance" in the context of a fully constructed and energized transmission facility. Therefore, the Board, on its own motion, will initiate evidentiary hearings, to be held at OAL, to consider such issues with respect to the Manitou-Whiting 230 KV transmission line.

The Board *FURTHER ORDERS* that this

matter be transmitted to the Office of Administrative Law, on notice to the parties, in order that evidentiary hearings may be held to consider those issues related to the application of the policy of "prudent avoidance" to the Manitou-Whiting 230 KV. transmission line. Prior to said transmittal, the Board, pursuant to *N.J.A.C.* 14:1-11.2 (a), *DIRECTS* its staff to schedule a conference at which the parties may discuss those procedural and substantive issues that will be addressed in this matter.

## FOOTNOTES

[1]The petition further requested Board approval for the expansion of the Company's Manitou substation and its use as a temporary storage yard during construction.

[2]The approvals granted by the Board were specifically conditioned upon the issuance of any necessary approvals from the Pinelands Commission.

[3]Oral argument was heard by the Board on April 4, 1990.

[4]By Order dated January 29, 1990, Judge William H. Huber determined that jurisdiction belonged with the Board and directed that the matter be transferred to the Board pursuant to Rule 1:13-4(a).

[5]Through a number of letters, the last being dated March 28, 1990, JCP&L agreed to defer placing the subject line in commercial operation until April 4, 1990, the date the Board was to hear oral argument on the motion of Berkeley and Ocean County. The Company reserved the right, however, to place the line in operation in the event of an emergency, which was defined as ". . . an outage or contingency event necessitating the temporary use of the line to prevent disruptions or to restore service to customers."

[6]The criteria, as presented by movants, are:

1. No adequate remedy at law;
2. A showing that irreparable injury will result if an injunction is not granted;
3. A showing that there is a reasonable probability of eventual success on the merits of the claim (Movants argue that the importance of this criterion varies, on a case by case basis, with the seriousness of the potential injury to the person seeking the injunction); and
4. A balancing of the relative hardship to the parties in granting or denying the relief.

[7]*N.J.A.C.* 14:1-14.1(a) provides:

> A *motion* for rehearing, reargument or reconsideration of a proceeding *may be filed by any party* within 15 days after issuance of a final decision or order by the Board. (Emphasis added).

[8]Pursuant to *N.J.A.C.* 14:1-9.1(a) and *N.J.A.C.* 14:1-9.2(b), the Board granted intervenor status to Berkeley, the two individually named residents of Berkeley and Ocean County at the oral argument held on April 4, 1990.

[9]Senate Bill No. 394 would, among other things, require the Commission on Radiation Protection to: (1) adopt interim rules and regulations, based on a policy of "prudent avoidance", establishing standards for maximum exposure to electric and magnetic fields at the edge of the right-of-way for transmission lines; and (2) in consultation with this Board, the electric utility industry and public interest groups, conduct a survey of the appropriate literature on electromagnetic fields and the potential health implications deriving from human exposure thereto, and to submit a report to the Governor and the New Jersey Legislature. This bill was adopted by the Senate on March 29, 1990, and is now pending in the Energy and Environment Committee of the Assembly.

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# Re MCI Telecommunications Corporation

Docket No. TX90050349

New Jersey Board of Public Utilities
May 22, 1990

ORDER directing interexchange telephone carrier to compensate local exchange carriers for intrastate intraLATA calls completed using carrier's services, and initiating investigation into appropriate rate of such compensation.

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1. MONOPOLY AND COMPETITION, § 83 — Telecommunications — IntraLATA services — Interexchange carriers.

[N.J.] Because the commission recently had reviewed its policy determinations with respect to the ban on intraLATA telephone competition and had reaffirmed that ban, it