

CAPTION SHEET

CASE MANAGEMENT SYSTEM

1. REPORT DATE: 00/00/00	:	
2. BUREAU: FUS	:	
3. SECTION(S):	:	
5. APPROVED BY:	:	4. PUBLIC MEETING DATE:
DIRECTOR:	:	00/00/00
SUPERVISOR:	:	
6. PERSON IN CHARGE:	:	7. DATE FILED: 08/09/07
8. DOCKET NO: A-110500 F0393	:	9. EFFECTIVE DATE: 00/00/00

PARTY/COMPLAINANT: REAMSTOWN #2 138/69 KV TAP & LINE

RESPONDENT/APPLICANT: PPL ELECTRIC UTILITIES CORP

COMP/APP COUNTY: LANCASTER

UTILITY CODE: 110500

ALLEGATION OR SUBJECT

LETTER OF NOTIFICATION OF PPL ELECTRIC UTILITIES CORPORATION, FILED PURSUANT TO 52 PA CODE CHAPTER 57 SUBCHAPTER G, WITH RESPECT TO THE REAMSTOWN # 2 138/69 KV TAP LINE IN EAST COCALICO TOWNSHIP, LANCASTER COUNTY.

DOCUMENT
FOLDER

DOCKETED
AUG 10 2007



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August 9, 2007

VIA HAND DELIVERY

James J. McNulty
Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
PO Box 3265
Harrisburg, PA 17105-3265

ORIGINAL

SECRETARY'S BUREAU

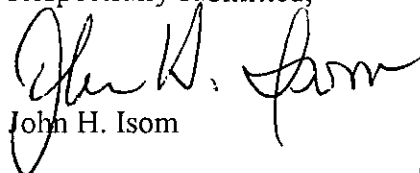
2007 AUG -9 PM 3:45

RE: Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G with Respect to Reamstown # 2 138/69 kV Tap and Line In East Cocalico Township, Lancaster County - Docket No. A-110500 F0393

Dear Secretary McNulty:

Enclosed, for filing, are an original and three (3) copies of the Letter of Notification of PPL Electric Utilities Corporation in the above-referenced proceeding. As indicated on the enclosed certificate of service, copies have been served on the parties in the manner indicated.

Respectfully submitted,



John H. Isom

JHI/jl

Enclosures

cc: Certificate of Service

DOCKETED
AUG 10 2007

DOCUMENT FOLDER

DOCKETED

AUG 10 2007

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Re: Letter Of Notification of PPL Electric :
Utilities Corporation, Filed Pursuant to 52 :
Pa. Code Chapter 57 Subchapter G. With :
Respect To The Reamstown # 2 138/69 kV :
Tap Line In East Cocalico Township, :
Lancaster County :

Docket No. A-110500 F0393

2007 AUG -9 PM 3:45
SECRETARY'S BUREAU

LETTER OF NOTIFICATION

TO THE PENNSYLVANIA PUBLIC UTILITY COMMISSION:

**ORIGINAL
DOCUMENT
FOLDER**

This Letter of Notification is filed by PPL Electric Utilities Corporation ("PPL Electric"), pursuant to 52 Pa. Code §57.72(d)(1), to request the Pennsylvania Public Utility Commission's ("Commission") approval for the siting and construction of a 138/69 kV tap transmission line in East Cocalico Township, Lancaster County. The purpose of the tap line is to supply electricity directly to a new transformer in the Reamstown ("Reamstown") 69-12 kV Substation. The proposed second circuit is required to meet the increasing demand for electricity and improve reliability in the Reamstown area.

1. The proposed Reamstown # 2 138/69 kV Tap Line will be approximately 375 feet long and will consist of one span which will extend from the existing Reamstown # 1 138/69 kV Tap Line to the Reamstown 69-12 kV Substation. The proposed one span tap line will supply electricity directly to a new transformer in the Reamstown 69-12 kV Substation. Three arms will be added to one existing structure to accommodate the installation of the proposed tap line. One additional pole, approximately 70 feet tall, and associated guying needs to be installed on property already owned by PPL Electric. The proposed tap line will consist of three power conductors. The power conductors will be 556.5 KCMIL 24/7 standard ACSR. No additional

overhead ground wire will be required because the existing ground wire provides the appropriate protection.

2. The new 138/69 kV Tap Line will be designed and constructed to operate at 138 kV although, initially, it will operate at 69 kV. In addition, the new tap line will be designed according to and will generally surpass National Electrical Safety Code (“NESC”) standards.

3. The land for which the proposed transmission line will be constructed is owned by PPL Electric, therefore, no impacts to the area are anticipated. It is anticipated that the proposed Reamstown # 2 138/69 kV Tap Line will cost approximately \$82,900. The total cost of the project, including the installation of the second transformer at the Reamstown Substation, is \$1,035,000. No approval, however, is required for the installation of the transformer.

4. This project has a scheduled construction start date of October 2007, to support the project’s in service date of May 2008.

5. Accompanying this Letter of Notification is a separately bound volume containing Exhibits A – C and Appendices A – C, which provide additional information about the project. This Letter of Notification and accompanying Exhibits and Appendices, which are incorporated herein by reference, contain all the information required by 52 Pa. Code § 57.72(d)(4).

6. The name and address of the Applicant are:

PPL Electric Utilities Corporation
Two North Ninth Street
Allentown, PA 18101

7. PPL Electric is a Pennsylvania corporation, which provides electric distribution and provider of last resort electric supply services, subject to the Commission’s regulatory jurisdiction, to approximately 1.4 million customers in all or portions of twenty-nine counties in eastern and central Pennsylvania.

8. The names, addresses and telephone numbers of PPL Electric's attorneys are:

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Fax: 610.774.6726
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9. PPL Electric's attorneys are authorized to receive all notices and communications regarding this Letter of Notification.

10. PPL Electric is proceeding by means of a Letter of Notification, instead of a full Application, pursuant to the Commission's regulations at 52 Pa. Code § 57.72(d). This tap line qualifies for use of a Letter of Notification because it is less than 2 miles long. As indicated above, the proposed transmission tap line will be approximately 375 feet in length.

11. The Necessity Statement for the project is provided as Exhibit "A" in the Exhibits and Appendices accompanying this Letter of Notification.

12. The project will improve the reliability of service in the Reamstown area. PPL Electric will be able to continue service to customers in the event of a failure of the existing transformer, and the project will enable PPL Electric to meet increasing demand in the Reamstown area. Further, the second circuit will enable substation maintenance to be performed during normal working hours with no interruption of service.

13. The project will be designed, constructed, operated and maintained in a manner that meets or surpasses NESC standards and all applicable legal requirements. The proposed project will not create an unreasonable risk of danger to the public health or safety. Descriptions of NESC standards and PPL Electric's design criteria and safety practices are set forth in Appendix A in the accompanying Exhibits and Appendices.

14. The Engineering Description of the project is provided in Exhibit "B" in the Exhibits and Appendices accompanying this Letter of Notification.

15. The proposed 375 foot transmission line will be located entirely on land owned by PPL Electric. Due to the small size of the proposed transmission line, no significant additional impact on land use is anticipated.

16. No railroads, communication towers, pipelines or other utilities will be affected by the proposed project.

17. The nearest aviation facility is the Morgantown Airport, which is 11 miles away from the project location. The project will have no effect on the airport or flight operations.

18. The following lists were reviewed for the presence of historical districts and structures in the project area:

National Historic Landmarks in Pennsylvania

National Register Historic Districts in Pennsylvania

National Register Individual Properties and Historic Districts in Pennsylvania

National Register/Listed and Eligible Properties in Pennsylvania

19. The closest structure of historical significance is Grace Chapel which is a Mennonite Church located on Muddy Creek Church Road. It is approximately 0.8 miles from the project location and is separated by South Muddy Creek Road, the Pennsylvania Turnpike, and U.S. Route 222. The chapel will not be impacted by the project.

20. The proposed project will not affect any unique geological, scenic or natural areas. No National Natural Landmarks, parks or recreational facilities are located near the project area. The proposed transmission line will not cross any wetlands or other aquatic resources. PPL Electric will employ its "Specifications for Soil Erosion and Sedimentation Control on Transmission Line Rights-of-Way" as appropriate to mitigate any effects of the project.

21. PPL Electric has coordinated with different state and federal agencies to obtain information regarding endangered and threatened species in close proximity to the project area. A review of the Pennsylvania Natural Diversity Inventory ("PNDI") records indicates that there are potential impacts under the jurisdiction the United States Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission for species of special concern and resources within, or in close proximity to, the project area. In addition, PPL Electric, as required by the Pennsylvania Department of Environmental Protection, will comply with the Bog Turtle Habitat screening requirements of the Pennsylvania State Programmatic General Permit. A Phase I Potential Bog Turtle Habitat Study will be submitted to the United States Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission.

22. Appendix B in the Exhibits and Appendices accompanying this Letter of Notification explains PPL Electric's standards for Magnetic Field Management.

23. Appendix C in the Exhibits and Appendices accompanying this Letter of Notification contains a list of involved governmental agencies, municipalities and other public entities.

24. The proposed project was reviewed with East Cocalico Township and Lancaster County, and neither the township nor the county has any objection.

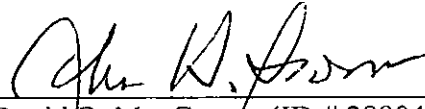
25. Copies of this Letter of Notification are being served in accordance with 52 Pa. Code §57.72(d)(3).

26. As soon as practicable after the filing of this Letter of Notification and the assignment by the Commission of a docket number, PPL Electric will publish notice of the filing in newspapers of general circulation in the area of the proposed project. Such notice will contain: (a) the date this Letter of Notification was filed with the Commission; (b) a brief description of the project and its location; (c) locations where the complete Letter of Notification may be reviewed by the public; and (d) an instruction that the interested parties should contact, within 15 days, James J. McNulty, Secretary, at the Commission's Harrisburg address.

27. This Letter of Notification is filed on the date set forth below. As provided in 52 Pa. Code § 57.72(d)(5), the Commission will review and, by order, approve or disapprove this Letter of Notification. If the Commission approves this Letter of Notification, the proposed project will be constructed as proposed herein without the formal application process set forth at 52 Pa. Code §§ 57.71 *et seq.* If the Commission does not approve this Letter of Notification, the Commission's Order shall direct PPL Electric to file for approval to construct the proposed project pursuant to the Commission's formal certification regulations.

WHEREFORE, PPL Electric Utilities Corporation respectfully requests that the Pennsylvania Public Utility Commission approve the siting and construction of the 375 foot Reamstown # 2 138/69 kV Tap Line in East Cocalico Township, Lancaster County that is explained above.

Respectfully submitted,



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Of Counsel:

Post & Schell, P.C.

Date: August 9, 2007

Attorneys for PPL Electric Utilities Corporation

AFFIDAVIT

STATE OF PENNSYLVANIA :
 :
COUNTY OF Lehigh : SS.
 :

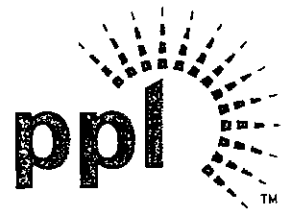
David G. DeCampli, being duly sworn according to law, deposes and states that he is President of PPL Electric Utilities Corporation, that he is authorized to and does make this affidavit for PPL Electric Utilities Corporation; and that the facts set forth in the foregoing Letter of Notification are true and correct to the best of his knowledge, information and belief; and that he expects PPL Electric Utilities Corporation to be able to prove the same at any hearing hereof.

David G. DeCampli
David G. DeCampli

SWORN TO AND SUBSCRIBED
before me this 3rd day of August, 2007

Therese M. Schaller
Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Therese M. Schaller, Notary Public
City of Allentown, Lehigh County
My Commission Expires Nov. 8, 2007
Member, Pennsylvania Association of Notaries



ORIGINAL

Before the
Pennsylvania Public Utility Commission

**REAMSTOWN #2
138/69 kV TAP LINE**

DOCKETED
AUG 10 2007

EXHIBITS AND APPENDICES IN SUPPORT OF THE
Letter of Notification

Application Docket No. A-110500 F0393

Submitted by: PPL Electric Utilities Corporation

**DOCUMENT
FOLDER**

SECRETARY'S OFFICE
2007 AUG -9 PM 3:45

SUMMARY

This filing is submitted by PPL Electric Utilities Corporation (PPL EU) pursuant to the Pennsylvania Public Utility Commission's (PUC or the Commission) regulations at 52 Pa. Code §§57.71 through 57.77 for PUC approval to add a second 138/69 kV circuit to a portion of the existing Reamstown #1 138/69 kV Tap Line. The proposed second circuit is required to meet the increasing demand for electricity and improve reliability in the Reamstown area. It will also allow substation maintenance to be performed *during normal working hours with no interruption of service.*

The estimated cost to design and construct the proposed 138/69 kV line is \$82,900. The project has a scheduled construction start date of October 2007 in order to meet an in-service date of May 2008.

This document, which describes the need for the project and discusses the engineering and siting analysis for the proposed reconstruction, consists of the following exhibits and appendices:

Exhibit "A" Necessity Statement

Exhibit "B" Engineering Description

Exhibit "C" Environmental Assessment

APPENDIX A PPL Design Criteria and Safety Practices

APPENDIX B PPL Magnetic Field Management Program

APPENDIX C List of Involved Governmental Agencies, Municipalities
and Other Public Entities

PPL ELECTRIC UTILITIES SERVICE TERRITORY

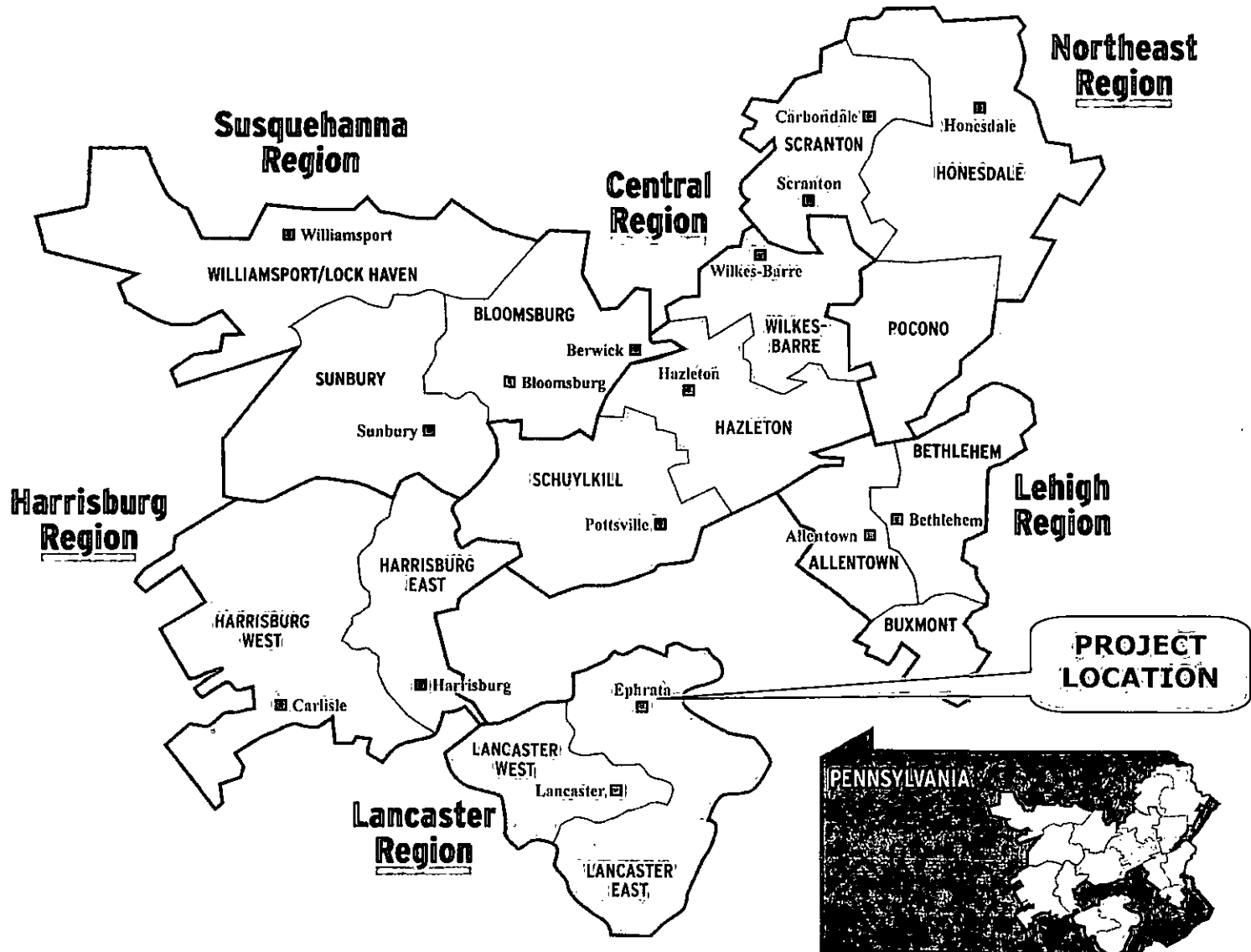


EXHIBIT "A"
REAMSTOWN #2 138/69 kV TAP LINE
NECESSITY STATEMENT

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MAP 1	PPL TRANSMISSION FACILITY MAP	EXHIBIT "A" MAP POCKET

2007 AUG -9 PM 3:45
SECRETARY'S BUREAU

EXHIBIT "A"
REAMSTOWN #2 138/69 kV TAP LINE
NECESSITY STATEMENT

A. INTRODUCTION

PPL EU is requesting PUC approval to add a second circuit to the existing #1 138/69 kV Reamstown Tap Line. The proposed Reamstown #2 138/69 kV Tap Line will be approximately 375 feet long and will extend from the existing Reamstown #1 138/69 kV Tap Line to the Reamstown 69-12 kV Substation. The proposed line will be designed and constructed to operate at 138 kV although, initially, it will operate at 69 kV. The proposed line is required to meet the increasing demand for electricity and improve reliability in the Reamstown area. It will also allow substation maintenance to be performed during normal working hours with no interruption of service.

The estimated cost to design and construct the proposed tap line is \$82,900. Installation is scheduled to begin in October 2007 to support the project's required in-service date of May 2008. The required in-service date is defined as the date the proposed facility needs to be placed in service to prevent overloads that have the potential to damage existing facilities and, thereby, cause the interruption of service to customers.

B. EXISTING SYSTEM

Presently, the one transformer at the Reamstown Substation is supplied by the existing single-circuit Reamstown #1 138/69 kV Tap Line. Figure 1 on page 3 depicts a functional diagram of the existing substation arrangement.

C. DEFINITION OF THE PROBLEM

In its present configuration, the failure of the transformer will remove the entire substation from service. During periods of high demand, such a failure would interrupt approximately 14 MW of load, which represents approximately 3,000 customers. These customers would remain without service until repairs could be made.

D. PROPOSED SOLUTION

In order to alleviate the problems discussed above, PPL EU plans the following system modifications and additions. First, a new 20 MVA transformer will be added at the Reamstown Substation, thereby doubling the capability of the substation. Second, a second 138/69 kV circuit will be added to the existing Reamstown #1 138/69 kV Tap Line. These changes will increase reliability and improve operating flexibility. The additional transmission line will keep half of the substation in service in the event of the failure of one of the transformers, thereby lowering the number of customers interrupted. Also, as part of load restoration following this failure, the increase in transformer capacity will allow one transformer to carry the entire load of the substation until repairs can be made on the failed transformer. In addition, it also allows one-half of the substation to be taken out of service for maintenance without necessitating the installation of a mobile substation, which would cost about \$60,000. Further, the duration of any outage that might occur will be shorter because the portion of the substation that is interrupted can be restored by manually closing a switch. The total estimated cost of this solution is \$1,035,000, which includes the estimated \$82,900 cost for installation of the Reamstown #2 138/69 kV Tap Line. Figure 2 on page 4 depicts the proposed system modifications.

E. FUNCTIONAL ALTERNATIVE

PPL EU could simply add the 20 MVA transformer at the Reamstown Substation and operate the substation with one transformer in service and the other as an on-site spare. In that configuration, a transformer failure would still interrupt the entire substation, and all customers would remain without service until repairs could be made. Although the spare transformer would be on site, it would still need to be tested before it was energized, which would add to the restoration time. The estimated cost of this alternative is \$770,000. PPL EU rejected this alternative because the proposed project, as described above, provides significant additional reliability and operating flexibility at a relatively small additional cost.

**FUNCTIONAL ONE-LINE DIAGRAM OF
EXISTING ARRANGEMENT**

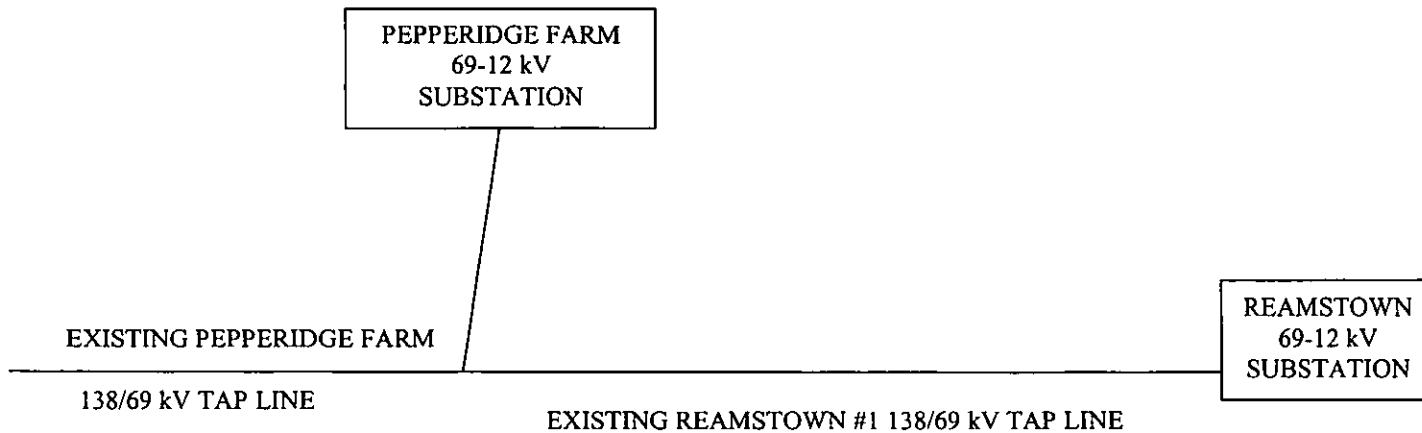


FIGURE 1

**FUNCTIONAL ONE-LINE DIAGRAM OF
PROPOSED MODIFICATION**

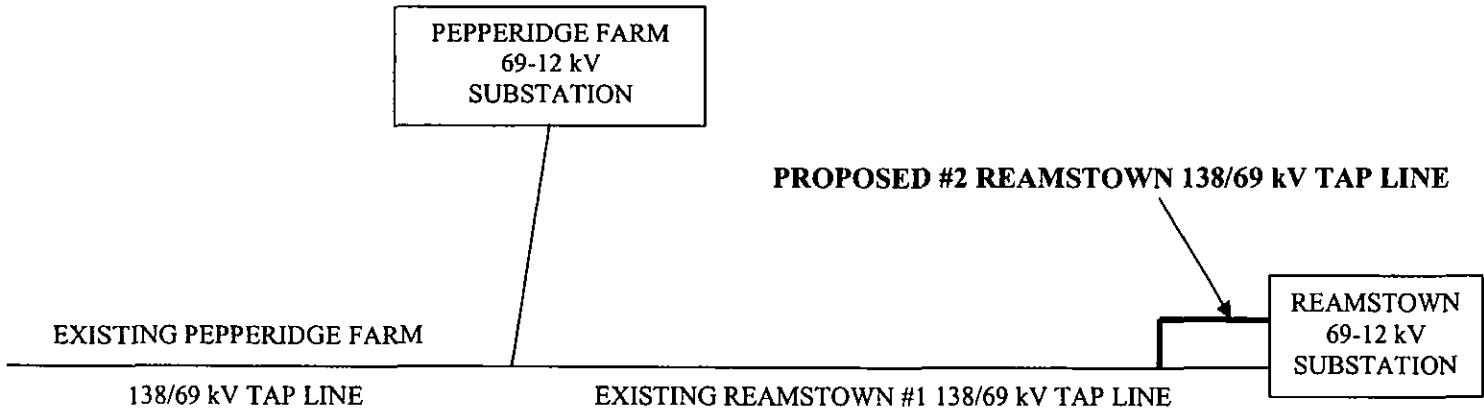


FIGURE 2



OVER SIZED DOCUMENTS

- 500KV OPERATION
- 230KV OPERATION
- 138KV OPERATION
- 69KV OPERATION

PROJECT LOCATION.	BY	REVIEWED	APPROVED
#3 & #4 138/69KV LINES.	RRC		NHJ
	RRC		NHJ
	RRC		NHJ

PLAN & PROFILE NO. TRANSMISSION MAP NO.

ACCT - 805201	REVIEWED	APPROVED G. HAKUN III	DATE 7/17/85	PPL ELECTRIC UTILITIES
SCALE - NONE				
BY - CDW				
PPL DRAWING NO. D191830	SHEET NO. 1	REV. 40		



EXHIBIT "B"
REAMSTOWN #2 138/69 kV TAP LINE
ENGINEERING DESCRIPTION

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MAP 1	REAMSTOWN #2 138/69 kV TAP LINE – PLOT PLAN EXHIBIT	

SECRETARY'S BUREAU
2007 AUG -9 P.13:46

EXHIBIT "B"
REAMSTOWN #2 138/69 kV TAP LINE
ENGINEERING DESCRIPTION

A. DESCRIPTION OF PROPOSED PROJECT

PPL EU proposes to add a second 138/69 kV circuit to the existing Reamstown #1 138/69 kV Tap Line. The proposed one span tap line will supply electricity directly to a new transformer in the Reamstown 69-12 kV Substation. The proposed tap line will be located in East Cocalico Township, Lancaster County. Refer to the plot plan at the end of Exhibit "B" which depicts the location of these facilities.

The proposed tap line will be approximately 375 feet long. Three arms will be added to one existing structure to accommodate the installation of the proposed tap line. One additional pole, approximately 70 feet tall, and associated guying needs to be installed on exiting PPL EU property. The proposed tap line will consist of three power conductors. The power conductors will be 556.5 KCMIL 24/7 strand ACSR. No additional overhead ground wire will be required because the existing ground wire provides the appropriate protection.

This new 138/69 kV line will be designed according to and will generally surpass National Electrical Safety Code standards. Additional design criteria and safety rules practiced by PPL EU are included in Appendix A. Because the proposed second circuit is being supported by structures that were constructed around 1992, the minimum conductor to ground clearance will be 30 feet which occurs at a maximum conductor temperature of 125°C. The design minimum conductor ground clearances and conductor thermal ratings are as follow:

TABLE 1
DESIGN MINIMUM CONDUCTOR CLEARANCES
FOR 556.5 KCMIL 24/7 STRAND ACSR*

<u>Condition</u>	<u>Single-Circuit Design Clearance-to-Ground</u>
Normal load, average weather (16°C ambient, 60°F temperature)	32.5 feet
Predicted extreme thermal load (125°C conductor, 257°F temperature)	30.0 feet
Predicted extreme weather conditions, 0°F (1-inch ice, 4 lbs. wind, -18°C)	33.0 feet

*Clearances based on a maximum tension of 4,850 pounds at 1 inch ice, 4 lbs. wind, -18°C and a ruling span of 250 feet.

CONDUCTOR THERMAL RATING
556.5 KCMIL 24/7 ACSR
125°C MAXIMUM CONDUCTOR TEMPERATURE

<u>Condition</u>	<u>Ambient Temperature °C</u>	<u>Wind Speed Knots</u>	<u>Ampacity Amps</u>
Summer Normal	35	0	810
Winter Normal	10	0	920
Summer Emergency	35	1.5	1030
Winter Emergency	10	1.5	1150

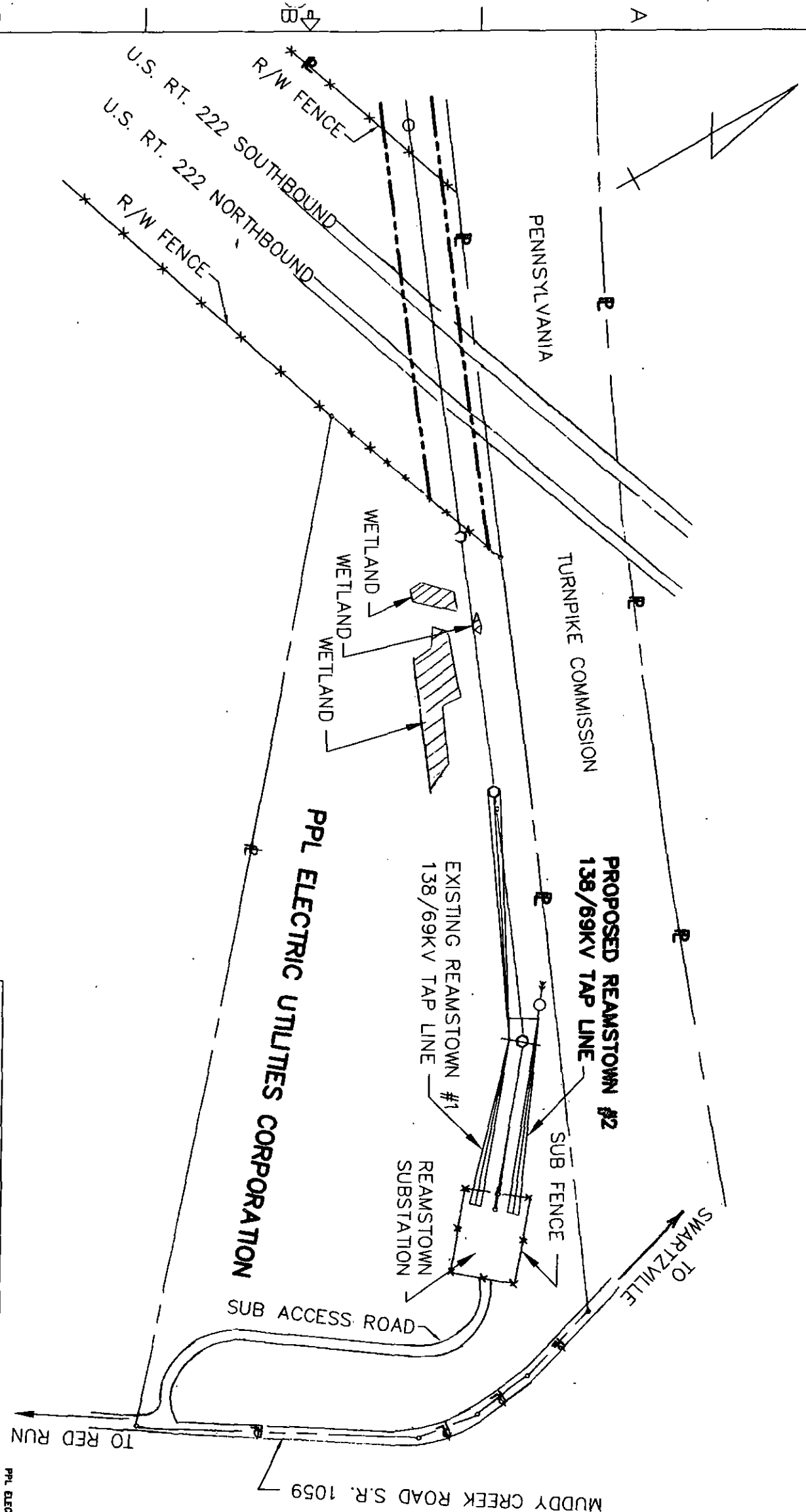
B. MAGNETIC FIELD MANAGEMENT

PPL EU's Magnetic Field Management Program is summarized in Appendix B and applied to reconstruction and new line projects. In order to lower magnetic field exposures, the program generally prescribes the use of line design that provides 5 feet higher ground clearances and reverse phasing new double-circuit lines where it is feasible to do so at low or no cost. The implementation of additional modifications will be considered, provided those modifications can be made at low or no cost.

For this project, reverse phasing will not be utilized to reduce magnetic field levels since this line is not located in close proximity to any residential communities. The proposed new circuit will utilize existing poles as previously explained in Section A that already incorporate the 30 foot ground clearance and includes the additional 5 foot higher ground clearance as part of the Magnetic Field Management Plan.

C. RIGHT-OF-WAY STATUS

The entire project is being constructed on PPL property. No additional right-of-way is required.



NO.	DATE	ACCT.	REVISION	BY	REVIEWED	APPROVED

ACCT - 161691	REVIEWED
SCALE -	BY - RRC
REAMSTOWN #2 138/69KV TAP LINE PLOT PLAN EXHIBIT "B"	
PPL DRAWING NO.	APPROVED
SHEET NO.	DATE
1	PPL ELECTRIC UTILITIES
REV.	PC CAD

EXHIBIT "C"
REAMSTOWN #2 138/69 kV TAP LINE
ENVIRONMENTAL ASSESSMENT

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2007 AUG -9 PM 3:16
SECRETARY'S BUREAU

EXHIBIT "C"
REAMSTOWN #2 138/69 kV TAP LINE
ENVIRONMENTAL ASSESSMENT

A. INTRODUCTION

PPL EU proposes to construct a second 138/69 kV transmission line to serve the existing Reamstown 69-12 kV Substation. The project involves the installation of one pole and approximately 375 feet of wire. This short tap line will be designed for 138 kV operation although, initially, it will be operated at 69 kV. The entire project will be constructed on the property owned by PPL EU.

The proposed project was reviewed with East Cocalico Township and Lancaster County, and neither the Township nor the County has any objection. A list of involved governmental agencies, municipalities and other public entities is presented in Appendix C.

B. LAND USE

The new tap line is just west of South Muddy Creek Road in East Cocalico Township. The line is bordered on the north by the east-west branch of The Pennsylvania Turnpike (I-76) and on the west by U.S. Route 222. The area to the east is comprised of industrial and commercial businesses. The area to the south is undeveloped property. Because of the small project size and its location on PPL EU property, no impacts to the area are anticipated.

No railroads, communication towers, pipelines or other utilities will be affected by the proposed project. Morgantown Airport is more than 11 miles away from the project location. There will be no impact on the airport or flight operations.

C. CULTURAL RESOURCES

This project was reviewed with the Pennsylvania Historical and Museum Commission (PHMC). PHMC has determined that due to the absence of historical sites and the small project size no further archaeological investigations are required.

The following lists were reviewed for the presence of historical districts and structures in the area:

- National Historic Landmarks in Pennsylvania
- National Register Historic Districts in Pennsylvania
- National Register Individual Properties and Historic Districts in Pennsylvania
- National Register/Listed and Eligible Properties in Pennsylvania

The closest structure of historical significance is Grace Chapel which is a Mennonite Church located on Muddy Creek Church Road. It is approximately 0.8 miles from the project location and is separated by South Muddy Creek Road, The Pennsylvania Turnpike, and U.S. Route 222. The chapel will not be impacted by the project.

D. NATURAL FEATURES

The proposed project will not affect any unique geological, scenic, or natural areas. No National Natural Landmarks, parks, or recreational facilities are located near the project area. Tree clearing is not required. Approximately 0.4 acres of low vegetation removal is required for the Reamstown #2 138/69 kV Tap Line. To mitigate impacts, all clearing work will be performed according to PPL EU's "Program for Vegetation Management." PPL EU has retained Mellon Biological Services to identify any wetlands within the project area. Per a field visit by Mellon Biological Services no wetlands will be impacted by the line construction. PPL EU will employ its "Specification for Soil Erosion and Sedimentation Control on Transmission Line Rights-of-Way" as appropriate.

E. THREATENED AND ENDANGERED SPECIES

PPL EU has coordinated with different state and federal agencies to obtain information regarding endangered and threatened species in close proximity to the project area. A review of the Pennsylvania Natural Diversity Inventory (PNDI) records indicates that there are potential impacts under the jurisdiction of the US Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission for species of special concern and resources within, or in close proximity to,

the project area. PPL EU has retained Mellon Biological Services to survey the project area and determine if any conflicts exist. Additionally PPL EU, as required by DEP, will comply with the bog turtle habitat screening requirements of the Pennsylvania State Programmatic General Permit. Based on a conversation with Rick Mellon, Qualified Bog Turtle Surveyor, he is preparing a report that verifies the lack of bog turtle habitat in the project area. A Phase I Potential Bog Turtle Habitat Study will be submitted to the US Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission.

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APPENDIX A	PPL Design Criteria and Safety Practices
APPENDIX B	PPL Magnetic Field Management Program
APPENDIX C	List of Involved Governmental Agencies, Municipalities and Other Public Entities

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SECRETARY'S BUREAU

APPENDIX A

PPL DESIGN CRITERIA AND SAFETY PRACTICES

The National Electrical Safety Code (NESC) is a set of rules to safeguard people during the installation, operation, and maintenance of electric power lines. The NESC contains the basic provisions considered necessary for the safety of employees and the public. Although it is not intended as a design specification, its provisions establish minimum design requirements. PPL Electric Utilities Corp. (PPL) has developed design specifications and safety rules which meet or surpass all provisions specified by the NESC.

Engineering Design Criteria and Parameters

The NESC includes loading requirements and clearances for the design, construction, and operation of power lines. The "loads" on conductors and supporting structures are the mechanical forces that develop from the weight of the conductors, the weight of ice on the conductors, plus wind pressure on the conductors and supporting structures. Loading requirements are the loads on the conductors and structures that are anticipated assuming certain ice and wind conditions. Loading requirements always contain "safety factors" to allow for unknown or unanticipated contingencies. The clearances and loading requirements contained in the NESC were developed to ensure public safety and welfare.

PPL transmission line design standards meet or surpass the NESC standards. For example, the relative order of grades of construction for conductors and supporting structures is B, C, and N; Grade B being the highest. According to the NESC standards, construction Grades B, C, or N may be used for transmission lines (except at crossings of railroad tracks and limited access highways where Grade B construction is specified). However, PPL designs all of its transmission lines for Grade B construction. The use of Grade B design and construction specifies such things as larger-minimum crossarm dimensions, larger-minimum conductor size, and increased safety factors.

Another example is the design parameters utilized to account for ice and wind loadings on the overhead ground wire (OHGW) and power conductors. The NESC standard ice and wind design magnitudes for the PPL territory are 0.5 inch thickness of radial ice combined with four pounds per square foot horizontal wind pressure (equivalent to 40-mile per hour wind velocity). The conductor sags and tensions used in line designs are the result of various ice and wind combinations, depending on the elevation at the line location and line design voltage. The conductor sags and tensions used in the design of all PPL transmission lines are at least 0.5-inch ice combined with eight pounds wind pressure (equivalent to 57 miles per hour wind velocity). This means that PPL lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL and NESC ground clearances for lines of various voltages.

138 kV

<u>Surface Underneath Conductors</u>	<u>Vertical Clearance to Ground</u>	
	<u>NESC Standard</u>	<u>PPL Design</u>
Roads, streets, alleys	21 Ft.	30 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	21 Ft.	30 Ft.
Spaces accessible to pedestrians only	17 Ft.	30 Ft.
Railroad tracks	31 Ft.	35 Ft.

230 kV

<u>Surface Underneath Conductors</u>	<u>Vertical Clearance to Ground</u>	
	<u>NESC Standard</u>	<u>PPL Design</u>
Roads, streets, alleys	23 Ft.	32 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	23 Ft.	32 Ft.
Spaces accessible to pedestrians only	19 Ft.	32 Ft.
Railroad tracks	31 Ft.	36 Ft.

500 kV

<u>Surface Underneath Conductors</u>	<u>Vertical Clearance to Ground</u>	
	<u>NESC Standard</u>	<u>PPL Design</u>
Roads, streets, alleys	28 Ft.	53 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	28 Ft.	53 Ft.
Spaces accessible to pedestrians only	24 Ft.	53 Ft.
Railroad tracks	38 Ft.	53 Ft.

A relay protection system is used to protect the public safety and welfare as well as equipment and the transmission system. Relay protection is installed for all transmission lines to automatically de-energize the line in the unlikely event that the line or supporting structure fails and the line contacts the ground.

Periodic Maintenance Program on All Transmission Lines

To ensure continued public safety and integrity of service, a periodic maintenance and inspection program is implemented for every transmission line. The program is administered through the use of helicopter patrols, with supplemental foot and structure

climbing patrols. A number of helicopter patrols are performed on all lines annually. The two-man helicopter crew flies parallel, to the left, and above the line so that the observer can look for signs of line damage or deterioration and observe clearances between vegetation and conductors. The observations are included in a report that is forwarded to the appropriate department for corrective action.

Foot and structure climbing patrol programs for a transmission line begin approximately three to five years after the line is energized, unless a helicopter patrol reports a need for earlier action. The frequency of foot patrols varies from once every year to once every several years depending on line type and age.

An assigned foot patroller checks right-of-way conditions, including access roads, bridges, pole washouts, tower footers, vegetation height and clearance to conductors, pole and tower deterioration and, with the use of binoculars, insulators, and condition of hardware. Identified problems are included in a report that is forwarded to the appropriate department for corrective action.

A scheduled line outage is required to perform an overhead patrol because of "hands-on" inspection of hardware. Overhead patrols are conducted on a schedule determined by line age, operating record, and observed general condition. The necessary repairs are also done during the inspection outage.

Personnel Safety Rules

The following are a few of the PPL safety rules that demonstrate the Company's concern for employee safety:

- Work procedures have been developed to allow work to be performed on energized facilities in a safe manner. When lines or apparatus are removed from service to be worked on, the Energy Control Process system is applied. This system provides that a red tag must be physically placed on the control handle of the de-energized equipment. The red tag may be removed only after proper authorization to energize the equipment. Various other tags are used for limited operations and informational purposes.

Employees will not apply or remove a tag or change the status of tagged equipment unless authorized.

- Temporary safety grounds are used on de-energized facilities for employee safety during maintenance, construction, or reconstruction work. Safety grounds are wires connecting the de-energized facility to an electrical ground. If the facility should be energized, the safety grounds will divert the current directly to ground and reduce the likelihood of personal injury. The conductor size and attachment clamps of temporary safety grounds must be capable of conducting anticipated fault currents. Rubber gloves, rubber sleeves, and additional rubber protective equipment are used as required when applying or removing temporary safety grounds to or from the lines or apparatus to be grounded. An approved nonconductive working stick of sufficient length to allow workers to maintain the following required minimum clearances is used to test that the line has been de-energized and to apply temporary safety grounds:

<u>Voltage-kV</u>	<u>Minimum Clearance</u>
138	3'-7"
230	5'-3"
500	11'-3"

Before applying grounds, a test is done to confirm that the line is de-energized. The voltage test device is checked before and after use to assure reliability. When ground pins are used to establish proper ground points, they are driven to a depth of not less than four feet as near vertical as possible.

- Poles or structures are inspected and examined for structural integrity before climbing. If there is any reason to believe that a pole is unsafe, it is stabilized before work is performed. Appropriate safety gear in the form of body belts, safety straps, hard hats, gloves, etc., is worn by linemen during line work activity.



**MAGNETIC
FIELD
MANAGEMENT**
PPL Electric Utilities
Corporation

APPENDIX B

DECEMBER 2004

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INTRODUCTION

At PPL Electric Utilities Corp. (PPL EU), magnetic field management means investigating and implementing methods at low or no cost to reduce magnetic fields in new or rebuilt transmission and distribution lines. This document explains PPL EU's Magnetic Field Management Program, which is part of PPL EU's larger Electric and Magnetic Fields (EMF) policy.

PPL EU's View

Some people are worried that electric and magnetic fields are harming their health. Others think the scientific research does not show a problem at all, and still others believe there's just too much scientific uncertainty to draw any conclusions.

Here's what we do know now. Various panels of scientists that have reviewed the EMF research generally have drawn two main conclusions. First, the large body of evidence does not demonstrate that EMF are harmful. Second, additional research is recommended to explore questions raised in some studies.

Given these conclusions, PPL EU is taking a reasoned approach in responding to the EMF issue. PPL EU's approach to the EMF issue consists of five elements:

- Providing EMF information to customers and employees
- Providing magnetic field measurements
- Establishing and implementing a magnetic field management program to reduce magnetic fields in new or rebuilt facilities when it can be done at no, or low, cost
- Integrating EMF in the public involvement process that PPL EU undertakes in the siting of transmission lines
- Have supported additional research

EMF Are All Around Us

Electric and magnetic fields occur in nature and in all living things. The earth, for instance, has a magnetic field, which makes the needle on a compass point north.

Electric fields and magnetic fields of a different type also surround every wire that carries electricity. In everyday life, these EMF arise from several basic sources, including power lines, electrical appliances, home and building wiring, other utility lines and cables, and currents flowing on water pipes. Though they often occur together, EMF are made up of two separate components:

Electric Fields

Electric fields are produced by the voltage—or electrical pressure—on a wire. The higher the voltage, the higher the electric field. As long as a wire is energized—has voltage present—an electric field is present (see Figure 1). In other words, an appliance, or an electric power line, doesn't actually have to be turned on to create an electric field. It just has to be plugged in.

Electric fields diminish with distance and can be blocked or partially shielded by objects such as trees and houses.

Magnetic Fields

Magnetic fields are created by the current or flow of electricity through a wire. Generally speaking, the higher the current, the higher the magnetic field. Because they only occur when current is flowing, magnetic fields are present only when the power is turned on (see Figure 1). Magnetic fields also diminish with distance, but—unlike electric fields—are not blocked by common objects. In recent years, public and scientific interest has turned toward the magnetic field component of EMF because of some scientific studies regarding these fields.

Figure 1

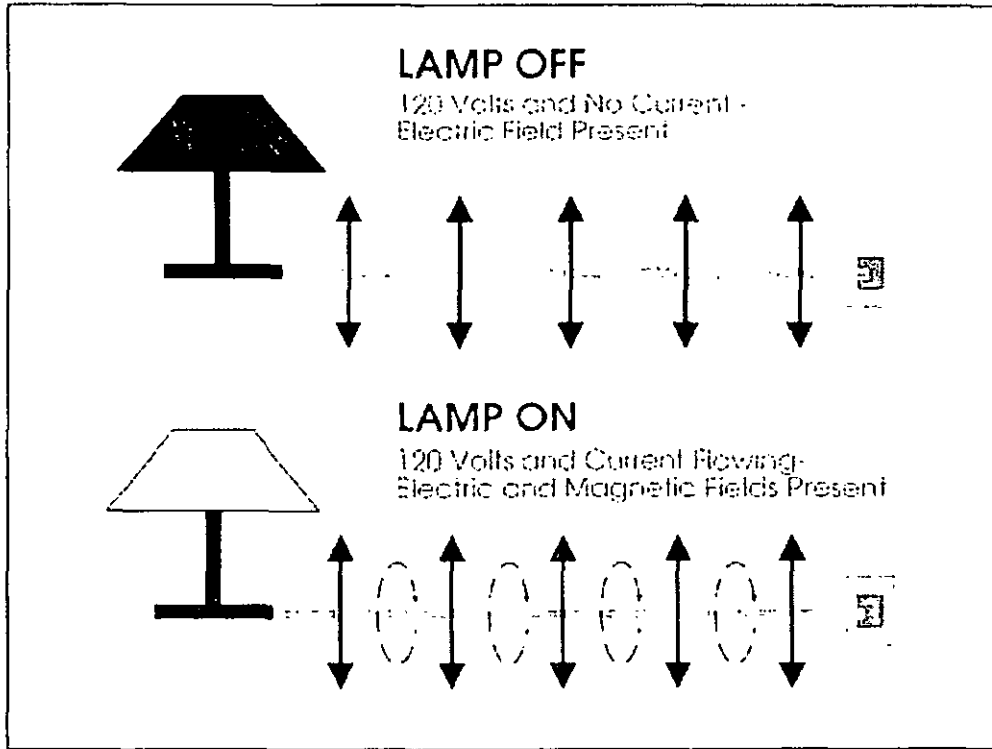


Figure 2









Magnetic field strengths decrease with distance Magnetic fields are measured in milligauss		Source: "EMF In Your Environment", U.S. Environmental Protection Agency 1992		
		At 6 inches	At 1 foot	At 2 feet
Clothes dryer		2 to 10	* to 3	*
Microwave oven		100 to 300	1 to 200	1 to 30
Toaster		5 to 20	* to 7	*
Power drill		100 to 200	20 to 40	3 to 6
Can opener		500 to 1500	40 to 300	3 to 30
Mixer		30 to 600	5 to 100	* to 10
Hair dryer		1 to 700	* to 70	* to 10
Color television		Data not available	* to 20	* to 8

FIGURE 2 * The magnetic field measurement at this distance from the operating appliance could not be distinguished from background measurements taken before the appliance had been turned on.

Measuring Magnetic Fields

Magnetic fields usually are measured in a unit called a milligauss. Magnetic field levels found in the living areas of homes typically range from less than 1 milligauss to about 4 milligauss according to the U.S. Environmental Protection Agency. They can be higher in some cases. The levels next to appliances can exceed 1,000 milligauss (1 gauss). Figures 2 and 3 show how the strength of the field falls off as you move away from the source, just as the heat of a campfire grows weaker as you walk away from it. For overhead power lines, the strength of the magnetic fields is dependent upon a number of factors that will be explained later. Those factors produce a magnetic field that drops off rapidly as you move away from the power line.

Figure 3

Sample Magnetic Field Levels in Milligauss				
Type of Overhead Power Line	Distance from the line			
	Under the line	50 ft.	100 ft.	200 ft.
220 kV and 500 kV	5-400	5-250	1-75	0.5-20
69 kV and 138 kV	3-80	0.5-2.5	0.1-10	0.1-3
12 kV and below	0.4-20	0.1-1	-	-

The magnetic field values provided in this table represent a general range of values associated with the types of overhead power lines listed and are provided for illustration. There will be circumstances in which there will be magnetic field levels above or below the range of values provided due to variations in such factors as height of the wires, current flow and so on.

DEVELOPMENT OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM

One element of our response to EMF concerns expressed by some of our customers is PPL EU's Magnetic Field Management Program. The program was initiated in March 1991 because PPL EU believes it makes good sense, as a matter of policy, to respond to the concerns expressed by some of our customers and to reduce magnetic fields in new and rebuilt facilities where it can be done with either no-cost or low-cost design changes.

This document updates the original program which has been revised several times since 1991. These guidelines were developed by PPL EU's EMF Working Group.

VARIABLES THAT AFFECT MAGNETIC FIELDS

Magnetic fields from transmission and distribution lines are a function of a number of design variables. The following parameters affect the magnetic field levels produced by transmission and distribution lines:

- Current
- Height of conductors above ground
- Configuration of conductors
- Distance from the line

EFFECT OF PHASE CURRENT ON MAGNETIC FIELDS

At power frequencies (i.e., 60 hertz), the magnetic field level is a function of the current or flow of electricity through a wire. Keeping all other parameters the same, the magnetic field is proportional to the current. Hence, if the current increases by 25 percent, the resulting magnetic field level will increase by 25 percent.

The overall load current on any line varies with the demand for power. It's usually highest during daytime hours and lowest at night. There also are weekly, monthly, seasonal and yearly variations.

The difference in the currents between each phase in a multiphase line also can affect the magnetic field. This difference is called phase unbalance. For a constant load, a statistical analysis of this phase unbalance can be made to determine its effect on the magnetic field. Close to the line, there is very little effect. However, the phase unbalance slows the rate at which the magnetic field decreases with distance from the line.

EFFECT OF CONDUCTOR CONFIGURATION ON MAGNETIC FIELDS

In the transmission and distribution of power, utilities like PPL EU presently use both three-phase and single-phase lines. Each phase on a three-phase power line has either a single conductor or a bundle of two or more conductors. In a three-phase system, the ground-level magnetic field is a result of the fields produced by the currents in each of the phases. Placing the three phases as close together as possible (compaction) creates some field cancellation, and the ground-level magnetic field is reduced. However, appropriate phase separation is required for the reliable operation of the line. In addition, the arrangement of the phases can create some; field cancellation and reduction of the ground-level magnetic field.

EFFECT OF DISTANCE FROM THE MAGNETIC FIELD SOURCE

Magnetic field strength diminishes with the vertical and lateral distances from the magnetic field source. Increasing the height of the conductors above ground is useful for magnetic field reduction at ground level, but may result in increased structure costs and increased aesthetic impact of the structures. Another possible method of increasing the distance to the magnetic field source is to increase the right-of-way requirements. By keeping buildings off increased rights of way, thereby requiring the public to live and work further away from lines, exposure to magnetic fields produced by the lines can be reduced. Increases in right of way are not always practical and may increase costs significantly, however.

SUMMARY OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM

Under its Magnetic Field Management Program, PPL EU has changed the way it builds and rebuilds some of its transmission and distribution lines. These design changes reduce magnetic field levels (assuming balanced circuit loadings and phase currents) by up to 69 percent in most of the company's new transmission lines. These guidelines now are being applied to new and reconstructed transmission facilities, based on this program.

The distribution component of the program focuses on 12 kV lines, the company's standard distribution voltage. It concentrates on the three-phase, primary 12 kV lines, since these are the most heavily loaded facilities and often are located in densely populated areas. The guidelines in this program are being applied to these three-phase, primary 12 kV lines.

A maximum 3-5 percent change in estimated cost was used as the limit for the guidelines since this value is consistent with low cost, is within estimating accuracy and is likely to have little impact on overall line costs.

The magnetic field calculations used in this document for the design of PPL EU's overall magnetic field management plan assume balanced load conditions among the phases and a fixed level of current, not necessarily representative of specific transmission or distribution lines. These levels were calculated using the Electric Power Research Institute's ENVIRO computer program. Under actual operating conditions, the magnetic field levels that result may vary due to such things as actual load per circuit, overall current on each phase conductor and the electrical configuration and operation of each line.

MAGNETIC FIELD MANAGEMENT PROGRAM GUIDELINES

The guidelines for magnetic field management are noted below, with discussion points for each.

OVERHEAD LINES

NEW OR REBUILT TRANSMISSION LINES

1. **Balance transmission circuit loads and phase currents as much as possible.**
 - PPL EU should continue to make every effort to balance loadings between the two circuits of a double circuit line when planning new or rebuilt facilities to maximize the effects of reverse phasing.
 - PPL EU should continue the practice of balancing single-phase loads across the three phases of the distribution system. (Unbalanced phase currents on the distribution system are reflected through to the transmission system.)
 - Unbalanced phase currents result in higher magnetic fields that do not drop off as quickly with distance as do the fields resulting from balanced phase currents.
 - For a 5 percent phase current unbalance, the magnetic field 50 feet from the centerline of a single circuit 138 kV line could be more than twice the value than if the same line had balanced phase circuits.
 - Balanced phase currents on each three-phase distribution circuit also reduce magnetic fields from the distribution circuits themselves. In addition, they reduce magnetic fields on the transmission system from which the distribution system circuits are supplied and connected through substations.
 - Apart from magnetic field considerations, balanced phase currents on each three-phase distribution circuit also reduce line losses and improve the system voltage.

2. **Continue with the present practice of using long-span construction as the PPL EU 138/69 kV standard**

- Structure designs for short-span and long-span construction are illustrated on Charts I and II, respectively.
 - *Short-span design does not significantly reduce magnetic fields when compared to long-span design even though it is more compact than long-span design. Comparison of the magnetic field values from Chart III indicates essentially the same values. Therefore, short-span design should not be used solely to reduce magnetic fields.*
 - PPL EU will continue to use long-span construction for 138/69 kV double-circuit lines and for single-circuit/future-double-circuit lines.
 - For single-circuit/future-double-circuit lines, PPL EU will continue to install two conductors on the top positions and one in the middle position as shown in Chart IV.
 - This arrangement minimizes magnetic fields as shown in Chart V by placing the three initial conductors higher on the structure, which increases the ground clearances, and by placing the conductors in a triangular configuration.

3. **Compact design structures are not a low-cost alternative and should be used for magnetic field reduction only in special applications.**

Chart VI illustrates the compact design structure.

- The compact design increases the initial installation costs by 79 percent when compared to the long-span design but reduces the magnetic field from 9 mG to 3 mG (about 67 percent) at the edge of the 100-foot-wide right of way as shown on Chart III.

4. **Reverse phase new or rebuilt double-circuit transmission lines for all voltage levels.**

- Reverse phasing was adopted by PPL EU in March 1991 for double-circuit 138/69 kV transmission lines and in April 1992 for all other double circuit transmission lines. Reverse phasing is shown in Chart VII. Reverse phasing will reduce the magnetic fields when the current flow on both circuits is in the same

direction. Calculated values contained here are based on balanced and equal phase currents on both circuits.

- Reverse phasing reduces the magnetic field of a double circuit 138 kV single pole transmission line from 29 mG to 9 mG (about 69 percent) at the edge of the 100-foot-wide right of way as shown on Chart III.
- Reverse phasing reduces the magnetic field of a double circuit 230 kV single pole transmission line from 49 mG to 16 mG (about 67 percent) at the edge of the 150-foot-wide right of way as shown on Chart VIII.
- Reverse phasing reduces the magnetic field of a double-circuit 500 kV single pole transmission line from 37 mG to 21 mG (about 43 percent) at the edge of the 200-foot-wide right of way as shown on Chart IX.
- When new or rebuilt double-circuit lines require tapping existing double-circuit lines, PPL EU will review the existing lines to determine if reverse phasing can be provided at low cost.
- Computer modeling is required to develop the optimum phasing and overall conductor arrangements for lines added to, or rebuilt in, multiple-line corridors.
 - Merely adding a reverse-phase double-circuit line to an existing transmission line corridor or reverse phasing a rebuilt line in the multiple-line corridor will not necessarily produce lower magnetic field levels at the edge of the corridor right of way.
 - The corridor must be computer modeled with all the lines, existing phase conductor locations and currents. Then, magnetic field calculations must be made varying the phase arrangements of the new or reconstructed line to determine the appropriate phasing arrangement.
 - Current flow direction on a line also must be considered. For example, a reverse-phased line should have the current flowing in the same direction on both circuits. If the current flow is in the opposite direction for one circuit, reverse phasing will not produce the lowest magnetic field and another phase arrangement that produces lower fields may need to be utilized.

5. Increase the minimum ground clearance for all new transmission lines.

138/69 kV Transmission Lines

- Increasing the minimum line design ground clearance from 25 feet to 30 feet may add up to about 5 percent to the installed cost of a new double-circuit single pole 138/69 kV line. For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. With long-span reverse-phase design, the magnetic field is reduced from 9 mG to 7 mG (about 22 percent) at the edge of a 100-foot-wide right of way as shown in Chart X.
 - In the actual design of transmission lines to include higher minimum ground clearances, there may be limited segments (such as highway crossings, severe slopes and transmission line crossing locations) where National Electrical Safety Code (NESC) minimum ground clearances may need to be used. The NESC minimum ground clearances are less than the increased ground clearance discussed previously.

230 kV Transmission Lines

- Increasing the minimum line design ground clearances from 27 feet to 32 feet may add up to about 5 percent to the cost of a single-circuit single-pole line (current standard). For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. By increasing the clearances, the magnetic field is reduced from 30 mG to 28 mG (about 7 percent) at the edge of a 150-foot-wide right of way.
- Increasing clearances from 27 feet to 32 feet could theoretically add up to about 2.8 percent to the cost of a double-circuit single-pole line (current standard) and reduce the magnetic field of a reverse-phase line from 16 mG to 15 mG (about 6 percent) at the edge of a 150-foot-wide right of way. Chart XI is a summary of this data.
- Studies are required for each new 230 kV line to determine optimum structure types, ground clearances, configurations and designs to reduce field levels. Such

studies could include analysis of reduction measures such as additional minimum ground clearances, increasing conductor tensions, using reduced phase spacing (a "Delta" configuration on a single-circuit line), installing the second circuit initially, and/or adding a second set of conductors that are reverse phased and operated in parallel with the first set (bundled/split phase).

500 kV Transmission Lines

- Increasing ground clearances from 33 feet to 53 feet may add up to about 4.5 percent to the cost of a single-circuit "H-frame" line (current standard). For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. By increasing the clearances, the magnetic field is reduced from 42 mG to 35 mG (about 17 percent) at the edge of a 200-foot-wide right of way.
- Increasing ground clearances from 33 feet to 53 feet could theoretically add up to 2.8 percent to the cost of a double-circuit "H-frame" line (current standard) and reduces the magnetic field of a reverse-phase line from 21 mG to 16 mG (about 24 percent) at the edge of a 200-foot-wide right of way. Chart XII is a summary of this data.
- Studies are required for each new 500 kV line to determine optimum structure types, ground clearances, configurations and designs to reduce field levels. Such studies could include analysis of reduction measures such as additional minimum ground clearances, increasing conductor tensions, using reduced-phase spacing (a "Delta" configuration on a single circuit line), installing the second circuit initially, and/or adding a second set of conductors that are reverse phased and operated in parallel with the first set (bundled/split phase).

RECONDUCTORING OR ADDING ADDITIONAL CIRCUITS TO EXISTING TRANSMISSION LINES

When reconductoring or adding additional circuits to existing transmission lines, PPL EU will evaluate low-cost or no-cost options for magnetic field management on a case-by-case basis.

When reconductoring existing transmission lines or adding additional circuits, low-cost alternatives may not exist; however, the following steps will be taken:

- For a single-circuit line, the use of a Delta arrangement or other modifications on the existing structure, with reduced-phase spacing, will be evaluated.
- For double-circuit lines, application of reverse phasing may reduce the magnetic field *under the line and within the right of way and will be evaluated.*
- For single- and double-circuit lines, evaluate using higher conductor tensions that can increase the minimum line design ground clearance.

DISTRIBUTION LINES

At the 12 kV distribution level, new main three-phase lines will continue to be constructed with five feet of additional ground clearance.

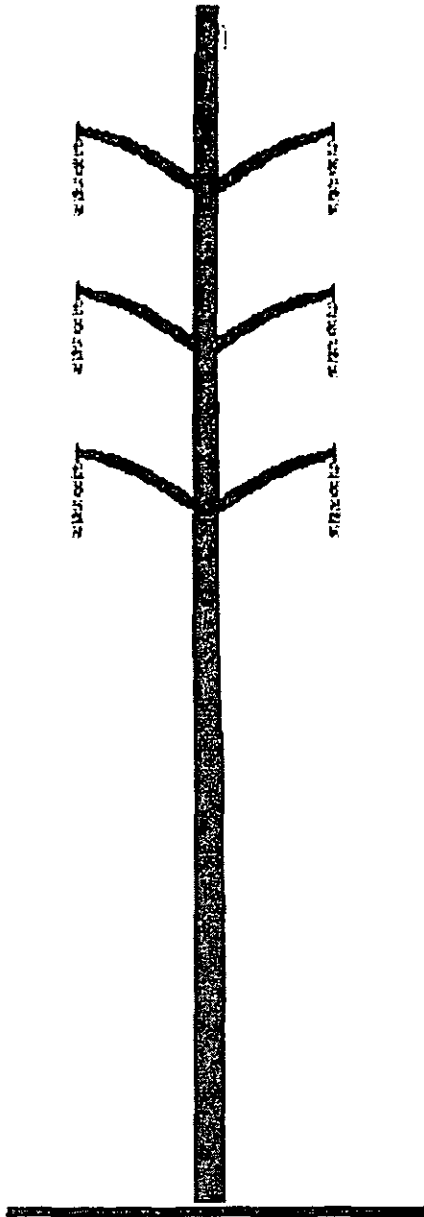
- Main lines are the most heavily loaded sections of a distribution line and therefore have the highest magnetic fields associated with them.
- Increasing the ground clearance by five feet reduces the magnetic field under the line from 14 mG to 11 mG using the standard eight-foot crossarm design. These values are based on increasing pole heights from 45 feet to 50 feet and a typical operating current of 300 amps per phase.
- *Chart XIII is a summary of this data. Increasing ground clearance by five feet could theoretically add about 5 percent to the cost of a typical distribution line.*

UNDERGROUND TRANSMISSION LINES

Underground transmission lines are required due to environmental or land use factors or restrictions on available clearances, PPL EU will evaluate options for magnetic field management techniques on a case-by-case basis.

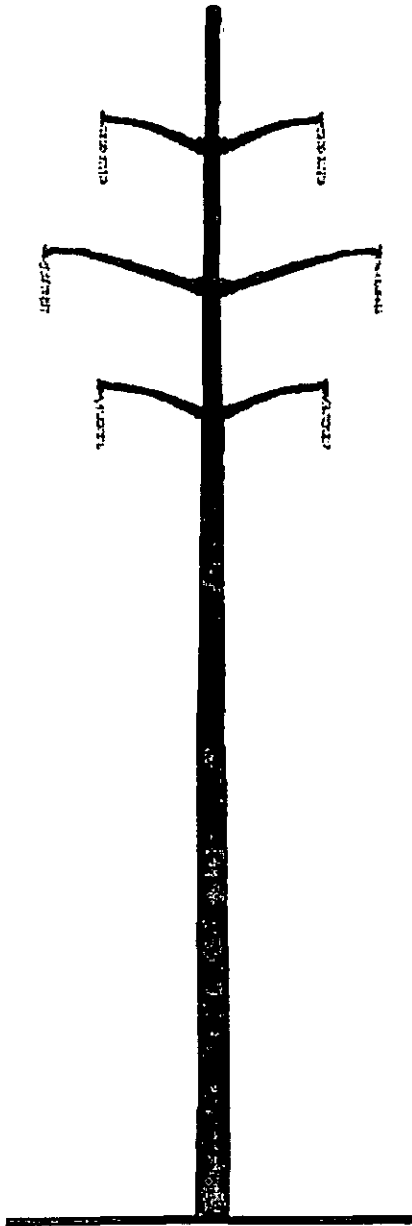
- The phase arrangement that produces the lowest field will be determined.
- The depth of burial of the line will be determined considering the cost of excavation and the *location of other buried utilities in the area.*
- The use of steel pipe ferromagnetic shielding that reduces magnetic fields will be evaluated.

Short-Span Construction



- More compact design
- Should not be used solely to reduce magnetic fields
- Typical conductor data:
 - 1 3/8" HS steel overhead ground wire - 7.3 feet sag
 - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 10.0 feet sag
 - Average span - 400 feet

Long-Span Construction Remains PPL EU 138 kV Standard



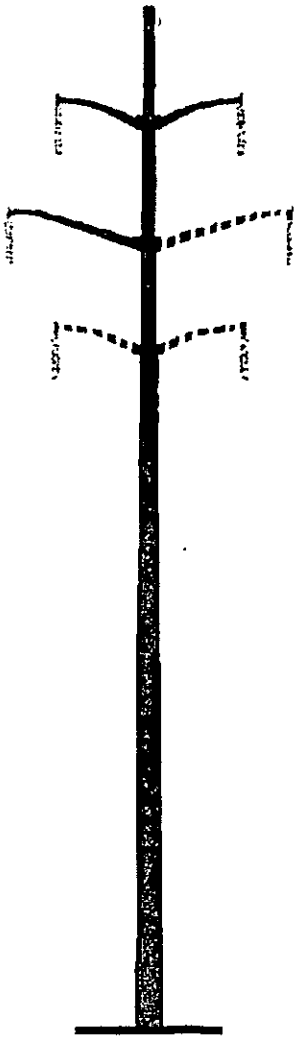
- Lower cost alternative
- Reduces magnetic fields due to higher structures
- Typical conductor data:
 - 1 3/8" HS steel overhead ground wire - 17.3 feet sag
 - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 23.0 feet sag
 - Average span - 600 feet

**138/69 kV REVERSE-PHASE TRANSMISSION LINES
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

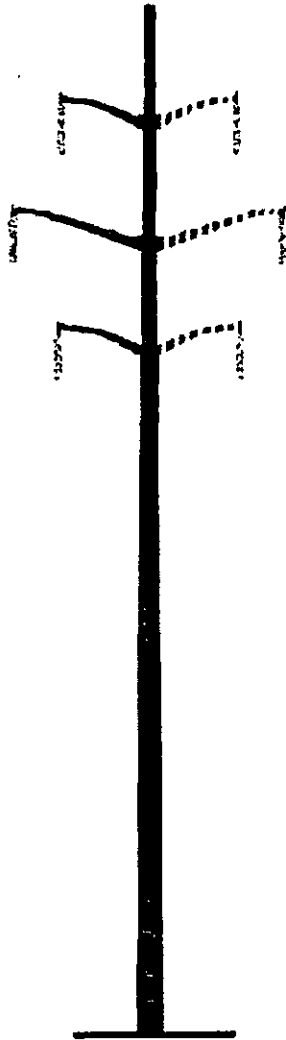
TYPE CONSTRUCTION	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
SHORT SPAN (CHART I)	30
SHORT SPAN (REVERSE PHASE)	8
LONG SPAN (CHART II)	29
LONG SPAN (REVERSE PHASE)	9
COMPACT (CHART VI)	14
COMPACT (REVERSE PHASE)	3

The edge of right of way is 50 feet from the line centerline.
The 400 ampere phase current is balanced between phases.
Calculations are based on a minimum ground clearance of 25 feet.
LONG SPAN, SHORT SPAN and COMPACT are double-circuit lines.

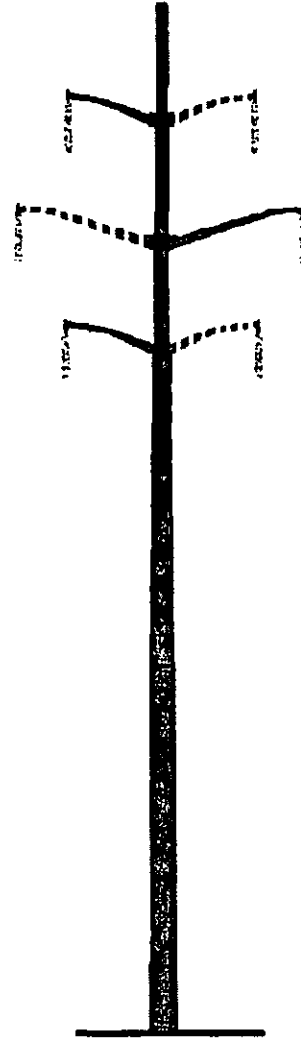
Typical Single-Circuit Structure Designs



Top/Middle



Vertical



Top/Middle/Bottom

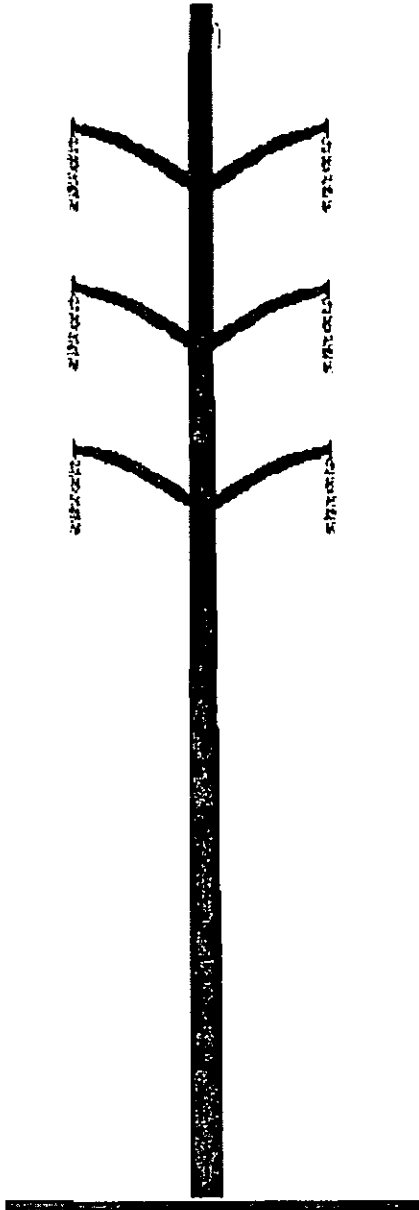
——— initial single circuit
- - - - - future second circuit

**138/69 kV SINGLE CIRCUIT TRANSMISSION LINES
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

TYPE CONSTRUCTION	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
TOP/MIDDLE/BOTTOM	20
VERTICAL	17
TOP/MIDDLE	12

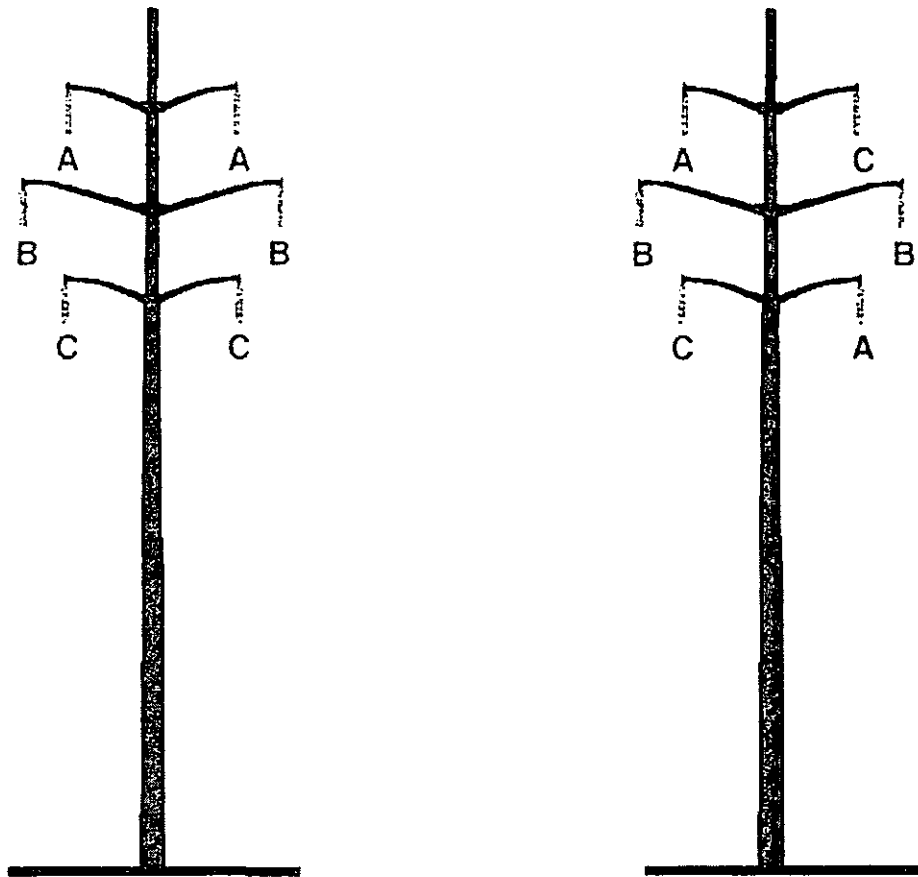
The edge of right of way is 50 feet from the line centerline.
The 400 ampere phase current is balanced between phases.
Calculations are based on a minimum ground clearance of 25 feet.

Compact Design Structure



- Minimize magnetic fields due to compact design
- Not a low-cost alternative
- Typical conductor data:
 - 1 3/8" HS steel overhead ground wire - 9.0 feet sag
 - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 9.0 feet sag
 - Average span - 300 feet

Reverse Phasing of Double-Circuit Transmission Lines



From: → → → → To:

Reverse phasing also can be one of the following phase arrangements:

A	B		B	A		B	C		C	A		C	B
C	C	or	C	C	or	A	A	or	B	B	or	A	A
B	A		A	B		C	B		A	C		B	C

**230 kV REVERSE-PHASE TRANSMISSION LINES
CALCULATED MAGNETIC FIELDS AT 800 AMPERES**

TYPE CONSTRUCTION	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
DOUBLE CIRCUIT POLE	49
DOUBLE CIRCUIT POLE (REVERSE-PHASE)	16

The edge of right of way is 75 feet from the line centerline.
The 800 ampere phase current is balanced between phases.
Calculations are based on a minimum ground clearance of 27 feet.

**500 kV REVERSE-PHASE TRANSMISSION LINES
CALCULATED MAGNETIC FIELDS AT 1100 AMPERES**

TYPE CONSTRUCTION	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
DOUBLE CIRCUIT POLE	37
DOUBLE CIRCUIT POLE (REVERSE PHASE)	21

The edge of right of way is 100 feet from the line centerline.
The 1,100 ampere phase current is balanced between phases.
Calculations are based on a minimum ground clearance of 33 feet.

**INCREASED 138/69 kV MINIMUM GROUND CLEARANCE
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

TYPE CONSTRUCTION	MINIMUM GROUND CLEARANCE FEET	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
SINGLE CIRCUIT TOP/MIDDLE	25	12
SINGLE CIRCUIT TOP/MIDDLE	30	10
LONG SPAN	25	29
LONG SPAN	30	26
LONG SPAN (REVERSE PHASE)	25	9
LONG SPAN (REVERSE PHASE)	30	7

The edge of right of way is 50 feet from the line centerline.
The 400 ampere phase current is balanced between phases.

**INCREASED 230 kV MINIMUM GROUND CLEARANCE
CALCULATED MAGNETIC FIELDS AT 800 AMPERES**

TYPE CONSTRUCTION	MINIMUM GROUND CLEARANCE FEET	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
SINGLE CIRCUIT TOP/MIDDLE	27	30
SINGLE CIRCUIT TOP/MIDDLE	32	28
DOUBLE CIRCUIT POLE	27	49
DOUBLE CIRCUIT POLE	32	46
DOUBLE CIRCUIT POLE (REVERSE PHASE)	27	16
DOUBLE CIRCUIT POLE (REVERSE PHASE)	32	15

The edge of right of way is 75 feet from the line centerline.
The 800 ampere phase current is balanced between phases.

**INCREASED 500 kV MINIMUM GROUND CLEARANCE
CALCULATED MAGNETIC FIELDS AT 1,100 AMPERES**

TYPE CONSTRUCTION	MINIMUM GROUND CLEARANCE FEET	MAGNETIC FIELD IN MILLIGAUSS AT THE EDGE OF THE RIGHT OF WAY
SINGLE CIRCUIT "H" STRUCTURE	33	42
SINGLE CIRCUIT "H" STRUCTURE	53	35
DOUBLE CIRCUIT POLE	33	37
DOUBLE CIRCUIT POLE	53	31
DOUBLE CIRCUIT POLE (REVERSE PHASE)	33	21
DOUBLE CIRCUIT POLE (REVERSE PHASE)	53	16

The edge of right of way is 100 feet from the line centerline.
The 1,100 ampere phase current is balanced between phases.

**12 KV DISTRIBUTION LINES
CALCULATED MAGNETIC FIELDS AT 300 AMPERES**

TYPE CONSTRUCTION	POLE HEIGHT FEET	MAGNETIC FIELD IN MILLIGAUSS*	
		AT CENTERLINE	AT 30 FEET FROM CENTERLINE
STANDARD CROSSARM	45	14	7
STANDARD CROSSARM	50	11	6

* Field level under the line at mid-span based on 300 amps, balanced loading, one meter above ground level.

APPENDIX C

**LIST OF INVOLVED GOVERNMENTAL AGENCIES, MUNICIPALITIES AND
OTHER PUBLIC ENTITIES**

Pennsylvania Historical and Museum Commission

Bureau for Historic Preservation

Commonwealth Keystone Building, Second Floor

400 North Street

Harrisburg, Pennsylvania 17120-0053

Attn: Mr. Douglas C. McLearn, Chief

Pennsylvania Department of Transportation

Commonwealth Keystone Building

400 North Street, 8th Floor

Harrisburg, Pennsylvania 17120

Attn: The Honorable Allen D. Beihler, P.E., Secretary

Department of Environmental Protection

P. O. Box 2063

Market Street Office Building

Harrisburg, Pennsylvania 17105-2063

Attn: Office of Field Operations

Lancaster County Planning Commission

50 North Duke Street

P.O. Box 83480

Lancaster, PA 17608-3480

Attn: Mr. James R. Cowhey, Executive Director

Lancaster County Commissioners
Lancaster County Courthouse
50 North Duke Street
PO Box 83480
Lancaster, PA 17608-3480
Attn: Mr. Mark Esterbrook, Chief Administrator

East Cocalico Township Supervisors
East Cocalico Township Municipal Building
100 Hill Road
Denver, PA 17517
Attn: Mr. Douglas B. Mackley, Chairperson

East Cocalico Township Planning Commission
East Cocalico Township Municipal Building
100 Hill Road
Denver, PA 17517
Attn: Mr. G. Sidni Schlegel, Chairperson

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Letter of Notification has been served upon the following persons, in the manner indicated, in accordance with the requirements of § 1.54 (relating to service by a participant).

VIA CERTIFIED MAIL RETURN RECEIPT REQUESTED

Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0053
ATTN: Mr. Douglas C. McLearen, Chief

Pennsylvania Department of Transportation
Commonwealth Keystone Building
400 North Street, 8th Floor
Harrisburg, PA 17120
ATTN: Honorable Allen D. Biehler, P.E.
Secretary

Department of Environmental Protection
P.O. Box 2063
Market Street Office Building
Harrisburg, PA 17105-2063
ATTN: Office of Field Operations

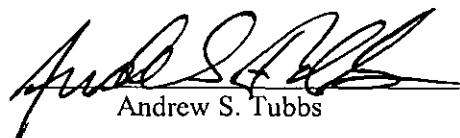
Lancaster County Planning Commission
50 North Duke Street
P.O. Box 83480
Lancaster, PA 17608-3480
ATTN: Mr. James R. Cowhey,
Executive Director

Lancaster County Commissioners
Lancaster County Courthouse
50 North Duke Street
P.O. Box 83480
Lancaster, PA 17608-3480
ATTN: Mr. Mark Esterbrook,
Chief Administrator

East Cocalico Township Supervisors
East Cocalico Township Municipal Building
100 Hill Road
Denver, PA 17517
ATTN: Mr. Douglas B. Mackley, Chairperson

East Cocalico Township Planning Commission
East Cocalico Township Municipal Building
100 Hill Road
Denver, PA 17517
ATTN: Mr. G. Sidni Schlegel, Chairperson

Date: August 9, 2007


Andrew S. Tubbs

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA PUBLIC UTILITY COMMISSION
P. O. BOX 3265, HARRISBURG PA 17105-3265

IN REPLY PLEASE
REFER TO OUR FILE
Secretary
717-772-7777

August 10, 2007

A-110500 F0393

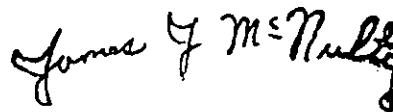
POST & SCHELL, PC
ATTORNEYS AT LAW
JOHN H. ISOM
17 NORTH SECOND STREET
12TH FLOOR
HARRISBURG PA 17101-1601

Dear Mr. Isom:

Receipt is acknowledged of the Letter of Notification of PPL Electric Utilities Corporation, which has been captioned and docketed to the above number.

This matter will receive the attention of the Commission and you will be advised of any further necessary procedure.

Sincerely,



James J. McNulty
Secretary

JJM: jih


DOCKETED
AUG 10 2007

**DOCUMENT
FOLDER**

DATE: August 10, 2007

SUBJECT: A-110500 F0393

TO: Bureau of Fixed Utility Services

FROM:  James J. McNulty, Secretary

DOCKETED
AUG 10 2007

Letter of Notification of PPL Electric Utilities Corporation

We attach hereto a copy of the Letter of Notification of PPL Electric Utilities Corporation, which has been captioned and docketed to the above number.

May we have a report prepared by your Bureau for Public Meeting.

Attachment

cc: Law Bureau

jih

**DOCUMENT
FOLDER**