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April 26, 2010

BY HAND

Rosemary Chiavetta
Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265

RE: Letter Of Notification Of PPL Electric Utilities Corporation, Filed Pursuant To 52 Pa. Code Chapter 57 Subchapter G, With Respect To The Hawley #1 and #2 138/69 kV Transmission Taps in Palmyra Township, Wayne County, Pennsylvania - Docket No. A-2010-

Dear Secretary Chiavetta:

Enclosed, for filing, are an original and six (6) copies of the Letter of Notification of PPL Electric Utilities Corporation, together with seven (7) copies of the accompanying exhibits and appendices which are contained in a separately-bound volume. Also enclosed is a CD containing copies of the exhibits and appendices.

As indicated on the enclosed certificate of service, copies of the Letter of Notification and accompanying exhibits and appendices are being served by certified mail, return receipt requested upon the involved governmental agencies and municipalities. If there are any questions concerning this matter, please contact me at the addresses or telephone numbers provided above.

Respectfully Submitted,

John H. Isom

JHI/jl

Enclosures

cc: Certificate of Service

ALLENTOWN HARRISBURG LANCASTER PHILADELPHIA PITTSBURGH PRINCETON WASHINGTON, D.C.

A PENNSYLVANIA PROFESSIONAL CORPORATION

**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 : Docket No. A-2010-
Respect To The Hawley #1 and #2 138/69 :
kV Transmission Taps in Palmyra :
Township, Wayne County, Pennsylvania :

SECRETARY'S BUREAU

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LETTER OF NOTIFICATION

TO THE PENNSYLVANIA PUBLIC UTILITY COMMISSION:

PPL Electric Utilities Corporation ("PPL Electric"), hereby files, pursuant to 52 Pa. Code §57.72(d), this Letter of Notification to request that the Pennsylvania Public Utility Commission ("Commission") approve the siting and construction of the double-circuit Hawley #1 and #2 138/69 kV Tap Lines ("Hawley Taps"), which will be approximately 250 feet in length and will connect the Blooming Grove-Honesdale 69 kV Transmission Line with the proposed Hawley 69-12 kV Substation ("Hawley Substation") in Palmyra Township, Wayne County, Pennsylvania. In support thereof, PPL Electric states as follows:

I. INTRODUCTION AND OVERVIEW

1. This Letter of Notification is filed by PPL Electric, a public utility that provides electric distribution, transmission, and provider of last resort services in Pennsylvania subject to the regulatory jurisdiction of the Commission.

2. PPL Electric's address is Two North Ninth Street, Allentown, Pennsylvania 18101.

3. PPL Electric's attorneys are:

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

4. PPL Electric furnishes electric service to approximately 1.4 million customers throughout its certificated service territory, which includes all or portions of twenty-nine counties and encompasses approximately 10,000 square miles in eastern and central Pennsylvania. PPL Electric is a "public utility" and an "electric distribution company" as

defined in Sections 102 and 2803 of the Pennsylvania Public Utility Code, 66 Pa. C.S. §§ 102, 2803.

5. PPL Electric owns approximately 5,000 miles of transmission lines operating at 69 kV (kilovolt) or higher, approximately 330 substations with a capacity of 10 MVA (megavolt ampere) or more, and approximately 43,000 miles of distribution lines operating at less than 69 kV.

6. This Letter of Notification includes the following accompanying attachments:

- Attachment 1 Necessity Statement.
- Attachment 2 Engineering Description.
- Attachment 3 Environmental Assessment.
- Attachment 4 PPL Electric Design Criteria and Safety Practices.
- Attachment 5 PPL Electric Field Management Program.
- Attachment 6 List of Involved Governmental Agencies, Municipalities, and Other Public Entities.

7. PPL Electric proposes to construct the double-circuit Hawley Taps, which will be approximately 250 feet in length and will connect the existing Blooming Grove-Honesdale 69 kV Transmission Line with the proposed Hawley Substation in Palmyra Township, Wayne County, Pennsylvania. The proposed Hawley Taps, together with the Hawley Substation and distribution lines associated therewith, are required to improve reliability of service and meet increasing demand in the vicinity of Palmyra Township.

8. Due to the small size of the tap lines and the presence of other transmission facilities in the area, it is anticipated that the Hawley Taps will have minimal incremental impacts on the area.

9. The estimated cost of the Hawley Taps is approximately \$530,000. Construction is scheduled to commence in August 2010, to support an in-service date of November 2011.

II. PROJECT SUMMARY

10. The Hawley Taps will be located entirely in Palmyra Township, Wayne County. An aerial plot plan is provided at the end of Attachment 2 to this Letter of Notification. The plot plan depicts the location of the existing and proposed facilities.

11. The proposed Hawley Taps will be approximately 250 feet in length. The taps will connect the existing Blooming Grove-Honesdale 69 kV Transmission Line with the proposed Hawley Substation. The purpose of the Hawley Taps, together with the proposed Hawley Substation, is to provide an additional source of supply to approximately 4,900 PPL Electric distribution customers located in the Palmyra Township area. The Hawley Taps and Hawley Substation are needed because the present distribution facilities that supply PPL Electric's distribution customers in that area exceed the normal planning guidelines based on PPL Electric's Reliability Principles and Practices Manual ("RP&P"). The Hawley Taps and the proposed Hawley Substation will relieve thermal overloading, reduce the number of customers served from the existing distribution lines, and resolve reliability issues associated with the existing distribution lines serving that area.

12. Presently, PPL Electric's distribution customers in this area are served from the Kimbles 69-12 kV Substation, the Lakeville 69-12 kV Substation, and the Tafton 66-12 kV Substation via each substation's associated 12 kV distribution lines: the Kimbles 26-1, Lakeville 88-4, and Tafton 80-2 12 kV distribution lines. There are no other 12 kV sources serving PPL Electric distribution customers in the Palmyra Township area.

13. The existing Kimbles 26-1 12 kV distribution line is projected to exceed the normal planning guidelines set forth in PPL Electric's RP&P in 2012. The normal and emergency ratings of the 477 kcmil (thousands of circular mils)¹ aluminum conductor of the Kimbles 26-1 12 kV distribution line are 11 MVA and 13 MVA, respectively. The peak load on the distribution line forecasted for the winter of 2012 is 11.1 MVA. Overloading the Kimbles 26-1 12 kV line could result in conductor damage or failure. Further, as a result of the overloading, the existing distribution line cannot accommodate the future load growth expected in the Palmyra Township area.

14. Additionally, as a result of the large number of customers experiencing multiple outages per year, the Kimbles 26-1 12 kV distribution line has repeatedly been among the worst performing circuits on the PPL Electric system. This is due to the length of the circuit, the rural nature of the area, and the high number of customers served by the line.

15. Also, the existing system configuration has limited transfer capability for maintenance and other equipment outages because the adjoining substations and supply lines are heavily loaded. Consequently, if the existing Kimbles 26-1 12 kV distribution line were to fail or require maintenance, approximately 2,000 customers would be out of service until the repairs could be completed.

16. The Lakeville 88-4, Tafton 80-2, and Kimbles 26-1 12 kV distribution lines currently exceed PPL Electric's RP&P for the number of customers per feeder. The RP&P provides that no more than 1,300 customers should be served from a 12 kV circuit. However, these three circuits presently serve approximately 1,423, 1,690, and 2,000 customers, respectively.

¹ A circular mil is the cross-sectional area of a wire one mil in diameter, where 1 kcmil = 0.5067 mm².

17. To alleviate these problems, PPL Electric plans to construct the new Hawley Substation and connecting distribution lines in the Palmyra Township area. PPL Electric plans to construct and install two new 12 kV distribution facilities, the new Hawley 1 and Hawley 2 12 kV distribution lines, that will be connected to the Hawley Substation to serve customer load in the Palmyra Township area to relieve loading and increase reliability and operating flexibility. The Hawley Substation and new 12 kV facilities will reduce peak loading on the existing Kimbles 26-1 12 kV distribution line by approximately 5.1 MVA. Additionally, the new facilities will resolve the customer count violations on the existing Lakeville 88-4, Tafton 80-2, and Kimbles 26-1 12 kV distribution lines. Once the proposed project has been completed, the above referenced lines will serve approximately 1,260, 1,160, and 1,120 customers, respectively, which are below the RP&P guideline of 1,300 customers per circuit. In turn, the new Hawley 1 and Hawley 2 12 kV distribution lines will serve approximately 1,000 and 570 customers, respectively.

18. The Hawley Substation will be supplied from the existing Blooming Grove-Honesdale 69 kV Transmission Line. The Hawley Taps proposed herein will connect the Hawley Substation with the Blooming Grove-Honesdale 69 kV Transmission Line. The Hawley Taps will be sited and designed as double circuit 138 kV transmission tap lines that will extend 250 feet from the Blooming Grove-Honesdale 69 kV Transmission Line to the proposed Hawley Substation. The Hawley #1 Tap and transformer #1 will be constructed and connected to the Hawley Substation. Initially, only a portion of the Hawley #2 Tap will be constructed and tied with the Hawley #1 Tap for operating flexibility. This portion of the Hawley #2 Tap will be connected to a temporary mobile transformer at the Hawley Substation to relieve outages on transformer #1 as necessary. The remaining portion of Hawley #2 Tap will not be constructed

and connected to the Hawley Substation until a second transformer is installed when future load increases make it appropriate to do so. The proposed Hawley Taps are depicted in the aerial plot plan provided at the end of Attachment 2 to this Letter of Notification. The Hawley Taps will be designed and constructed for 138 kV operation, although they initially will operate at 69 kV.

19. The Hawley Taps will require two steel mono-poles each which will vary in height. The tap poles will be approximately 105 feet in height. The remaining two poles will be approximately 65 feet in height. All of the poles will be secured with anchor guys. The proposed tap lines will each consist of three power conductors and one overhead ground wire. The power conductors will be 556.5 kcmil, 24/7 strand ACSR.² The overhead ground wire will be 3/8-inch steel and will provide lightning protection for the proposed Tap Lines.

20. The Hawley Taps will be designed to comply with, and will generally surpass, the applicable minimum standards in the National Electrical Safety Code (NESC).

21. The total estimated cost to design and construct the proposed project is \$2.1 million, which includes the cost of the Hawley Substation and the distribution work related thereto, and the estimated \$530,000 cost for the proposed Hawley Taps.

22. Construction is scheduled to commence in August 2010, for an in service date of November 2011.

23. The proposed Hawley Taps and Hawley Substation will be located in Palmyra Township, Wayne County. The Hawley Taps and Hawley Substation will be constructed entirely on a 4.0 acre parcel owned in fee by PPL Electric.

24. Because the proposed Hawley Taps will be only 250 feet in length and will be installed in the vicinity of existing transmission lines as depicted in an aerial plot plan at the end

² Aluminum conductor steel reinforced.

of Attachment 2 to this Letter of Notification, it is anticipated that the Hawley Taps will have minimal incremental impacts on the area. The proposed 4.0 acre site for the Hawley Substation is traversed by the existing Blooming Grove-Honesdale 69 kV Transmission Line. The site is zoned for Residential use and is currently a wooded parcel. The parcel is bordered on the north, east, and west sides by wooded parcels, and is bordered on the south by a combination of wooded and commercial properties.

25. Accompanying this Letter of Notification is a separately bound volume containing Attachments 1-6, which provide additional information about the Hawley Taps. This Letter of Notification and accompanying Attachments, which are incorporated herein by reference, contain all the information required by 52 Pa. Code § 57.72(d)(4).

III. LETTER OF NOTIFICATION

26. 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). The Hawley Taps qualify for use of a Letter of Notification because the tap lines will be less than two miles in length.

27. The Necessity Statement for the Hawley Taps is provided as Attachment 1 accompanying this Letter of Notification. As explained in greater detail therein, the purpose of the Hawley Taps is to improve the reliability of service and to reduce load on the existing distribution facilities in the vicinity of Palmyra Township, Wayne County.

28. In determining the need for the Hawley Taps, PPL Electric considered one alternative electrical solution or functional configuration. As an alternative functional configuration to the Hawley Taps and Hawley Substation, PPL Electric considered building a new 12 kV distribution line and terminal from the Kimbles 69-12 kV Substation in order to

relieve the Kimbles 26-1 12 kV distribution line. This functional configuration would require the new 12 kV distribution line to follow the same line route as the Kimbles 26-1 line for about 2.5 miles. However, this alternative functional configuration would not improve reliability because two distribution circuits installed on the same poles are susceptible to the same potential outages. Costly upgrades to the Kimbles Substation would also be necessary to accommodate the additional line and terminal. Further, these facilities would only be temporary because projected load growth in the area would eventually require the installation of a new substation to meet the projected increase in demand. PPL Electric rejected this alternative functional configuration because the proposed Hawley Taps and Hawley Substation provide additional reliability and operating flexibility, allow for a better long-term plan for the entire area, and avoid the investment in facilities that would be useful only temporarily.

29. The proposed Hawley Taps will not create any unreasonable risk of danger to the public health or safety. The Hawley Taps will be designed, constructed, operated, and maintained in a manner that meets or surpasses all applicable NESC minimum standards and all applicable legal requirements. Descriptions of NESC standards, PPL Electric's design criteria, and PPL Electric's safety practices are provided in Attachment 4 hereto.

30. The Engineering Description of the Hawley Taps is provided in Attachment 2 accompanying this Letter of Notification.

31. The proposed Hawley Taps will be located entirely on the site for the Hawley Substation, which is owned in fee by PPL Electric. As a result, no additional rights-of-way are necessary for the proposed Hawley Taps.

32. No communication towers, pipelines, or other utilities will be affected by the proposed Hawley Taps. The nearest airports are approximately 2.8 miles southwest and 5.0

miles northwest of the proposed Hawley Taps. PPL Electric will contact the PennDOT Bureau of Aviation and the Federal Aviation Administration to ensure that the proposed Hawley Taps will not be a hazard to flight operations.

33. The proposed Hawley Taps were reviewed with the Pennsylvania Historical and Museum Commission (PHMC). The PHMC has determined that, due to the absence of historical sites and the small project size, no further archaeological investigations are required.

34. The proposed Hawley Taps will not affect any unique geological, scenic, or natural areas. Lake Wallenpaupack and the Pennsylvania State Game Lands Number 183 are located approximately 0.50 miles and 1.0 miles, respectively, from the project location. However, no impacts to these features are anticipated due to the small size of the project, the distances from the project area, and development between these features and the project area.

35. The Hawley Taps will not cross any wetlands or other aquatic resources. Tree clearing is required for the proposed Hawley Taps, and PPL Electric will apply its “Specifications for Initial Clearing and Control of Vegetation on or Adjacent to Electric Right-of-Way Through Use of Herbicides, Mechanical, and Hand Clearing Techniques” to mitigate any impacts. PPL Electric will also acquire and comply with any required soil erosion and sedimentation control permit conditions.

36. PPL Electric has consulted with state and federal agencies to obtain information regarding endangered and threatened species in close proximity to the Hawley Taps. These agencies have reported that no impacts are anticipated and no further coordination is needed for this project.

37. The Hawley Taps were reviewed with representatives of Palmyra Township and Wayne County. The Township and the County have no objection to the Hawley Taps.

38. Attachment 6 accompanying this Letter of Notification contains a list of the involved governmental agencies, municipalities, and other public entities. Copies of this Letter of Notification are being served on the agencies listed in Attachment 6 in accordance with 52 Pa. Code § 57.72(d)(3).

39. Attachment 5 accompanying this Letter of Notification explains PPL Electric's standards for Magnetic and Field Management.

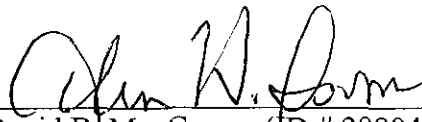
40. As soon as practicable after the filing of this Letter of Notification and the assignment by the Commission of a docket number, PPL Electric will publish notice of the filing in newspapers of general circulation in the area of the proposed Hawley Taps. Such notice will contain: (a) the date this Letter of Notification was filed with the Commission; (b) a brief description of the Hawley Taps and their 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.

41. 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 Hawley Taps will be constructed as proposed herein without the formal application process set forth at 52 Pa. Code §§ 57.71, *et seq.*

IV. CONCLUSION

WHEREFORE, PPL Electric Utilities Corporation respectfully requests that the Pennsylvania Public Utility Commission approve the siting and construction of the Hawley #1 and #2 138/69 kV Tap Lines in Palmyra Township, Wayne County, Pennsylvania, that is explained above and in the Attachments hereto.

Respectfully submitted,



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Of Counsel:

Post & Schell, P.C.

Date: April 26, 2010

Attorneys for PPL Electric Utilities Corporation

VERIFICATION

I, David G. DeCampli, being the President of PPL Electric Utilities Corporation, hereby state that the facts above set forth are true and correct to the best of my knowledge, information and belief and that I expect that PPL Electric Utilities Corporation to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa. C.S. § 4904 relating to unsworn falsification to authorities.

Date: 4/14/10



David G. DeCampli

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Before the
Pennsylvania Public Utility Commission

**HAWLEY #1 AND #2 138/69 kV
TAP LINES**

ATTACHMENTS IN SUPPORT OF THE
Letter of Notification

Application Docket No. _____

Submitted by: PPL Electric Utilities Corporation

SUMMARY

A Letter of Notification is being submitted by PPL Electric Utilities Corporation (PPL Electric) pursuant to the Pennsylvania Public Utility Commission's (PUC or the Commission) regulations at 52 Pa. Code §§57.71 through 57.77 for approval to site and construct the Hawley #1 and #2 138/69 kV Tap Lines to serve the planned Hawley 69-12 kV Substation. Together, the tap lines and substation are required to meet the increasing demand for electricity and improve reliability of service in the Palmyra Township area of Wayne County. The proposed tap will be designed and constructed for double-circuit 138 kV operation, although initially only one circuit will be installed and operated at 69 kV. The transmission taps are subject to the PUC's siting regulations because the proposed line will be designed and constructed for 138 kV operation.

The total estimated cost of the proposed transmission work is \$530,000. In addition, PPL Electric estimates that it will spend \$2.1 million (including the transformer cost) for the substation and distribution work associated with this project. This project has a scheduled construction start date of August 2010, in order to meet an in-service date of November 2011.

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

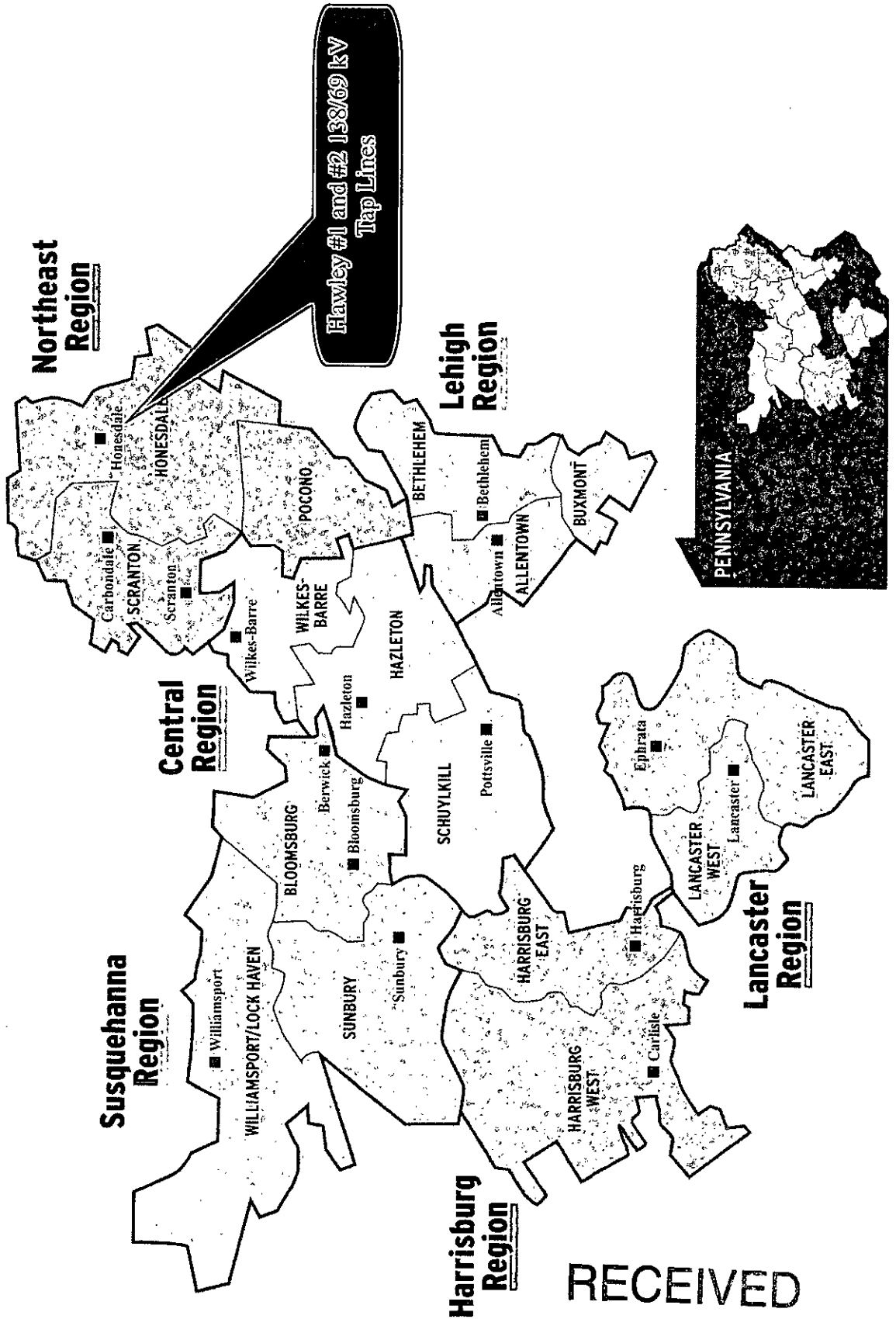
Attachment "1"	Necessity Statement
Attachment "2"	Engineering Description
Attachment "3"	Environmental Assessment
Attachment "4"	PPL Electric Design Criteria and Safety Practices
Attachment "5"	PPL Electric Magnetic Field Management Program
Attachment "6"	List of Involved Governmental Agencies, Municipalities

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PPL ELECTRIC UTILITIES SERVICE TERRITORY



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ATTACHMENT "1"
HAWLEY #1 AND #2 138/69 kV TAP LINES
NECESSITY STATEMENT

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

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MAP

MAP 1	PPL ELECTRIC SYSTEM MAP.....	ATTACHMENT "1" MAP POCKET
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ATTACHMENT "1"
HAWLEY #1 AND #2 138/69 kV TAP LINES
NECESSITY STATEMENT

A. INTRODUCTION

PPL Electric is requesting PUC approval to site and construct a double-circuit 138/69 kV transmission tap line. The proposed Hawley #1 and #2 138/69 kV Taps will extend approximately 250 feet from the Blooming Grove-Honesdale 69 kV Transmission Line to the new Hawley 69-12 kV Substation. The proposed tap will be designed and constructed for double-circuit 138 kV operation, although initially only one circuit will be installed and operated at 69 kV. In the future, the second circuit will be installed when demand requires a second transformer at the substation. The tap lines and new substation are required to meet the increasing demand for electricity and improve reliability in the Palmyra Township, Wayne County area.

The estimated cost to design and construct the taps is \$530,000. Construction is scheduled to begin in August 2010 to support the project's required in-service date of November 2011. 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*.

A PPL Electric system map showing existing transmission facilities with a design voltage of 35 kV or greater is included in the Attachment "1" map pocket. This filing addresses only the existing and proposed 138/69 kV regional transmission system in the Palmyra Township area.

B. EXISTING SYSTEM

Presently, the area of concern is served from the Kimbles 69-12 kV Substation, the Lakeville 69-12 kV Substation, and the Tafton 69-12 kV Substation via each substation's associated 12 kV distribution lines: the Kimbles 26-1, Lakeville 88-4, and Tafton 80-2 12 kV distribution lines.

Presently, these 12 kV distribution lines serve over 4,900 customers in the Palmyra Township area. See Figure 1 for the existing transmission system configuration and Figure 3 for the existing distribution system configuration in this area on pages 5 and 7.

C. DEFINITION OF THE PROBLEM

The project, including the Hawley #1 and #2 138/69 kV Taps will resolve three separate problems. First, load on the Kimbles 26-1 distribution line is projected to exceed the normal planning guidelines based on PPL Electric's Reliability Principles and Practices (RP&P). The existing Kimbles 26-1 12 kV conductor is a 477 kcmil aluminum conductor. The planning guideline for this type of conductor is 11,000 kVA (kilovolt Ampere). The winter 2012 peak load is projected to be 11,100 kVA. Overloading the Kimbles 26-1 12 kV line could result in conductor damage or failure, which would interrupt service to approximately 2,000 customers until repairs are made. As a result, the existing distribution line cannot accommodate the future load growth expected in the Palmyra Township area.

Second, the Lakeville 88-4, Tafton 80-2, and Kimbles 26-1 distribution lines currently exceed PPL Electric's RP&P guidelines for customer count per feeder. The RP&P provides that no more than 1,300 customers should be served from a 12 kV circuit. Presently, these three circuits serve approximately 1,423, 1,690, and 2,000 customers, respectively. This project will reduce the customer count per feeder and comply with the RP&P.

Third, as a result the large number of customers experiencing multiple outages per year, the Kimbles 26-1 line has been among the worst performing circuits on the PPL Electric system seven times in the past 24 quarters. This is due to the length of the circuit, the rural nature of the area, and the high number of customers per circuit. Also, the existing system configuration has limited transfer capability with the adjoining substations for maintenance and other outages on the equipment. Therefore, if the existing distribution lines were to fail or require maintenance, customers would be out of service until the repairs could be completed.

D. PROPOSED SOLUTION

In order to resolve the issues discussed above, PPL Electric seeks PUC approval to construct the Hawley #1 and #2 138/69 kV Taps. After the Commission's approval of the new Tap Line, PPL Electric will also construct the new Hawley 69-12 kV Substation that will be supplied by the Tap Line. Two new 12 kV distribution lines will be installed from the new substation to serve customer load in the area. These system additions will relieve loading and increase reliability and operating flexibility.

The new 12 kV distribution lines will serve part of the load currently being supplied by the Kimbles 26-1 distribution line. This reinforcement project will reduce peak loading on the Kimbles 26-1 distribution line by 5.1 MVA (megavolt ampere). Additionally, the new facilities will also resolve the customer count violations on the existing Lakeville 88-4, Tafton 80-2, and Kimbles 26-1 distribution lines. Once this project is implemented, the above referenced lines will serve approximately 1,260, 1,160, and 1,120 customers, respectively, which are below the RP&P guideline of 1,300 customers per circuit.

The new Hawley Substation will serve approximately 1,570 customers and 8.9 MVA of load. The two new 12 kV distribution lines will reduce the length and number of customers per feeder in the Palmyra Township area. Once this project is complete, the new Hawley 1 and Hawley 2 12 kV distribution lines will serve approximately 1,000 and 570 customers, respectively. This will reduce the customers' exposure to outages and reduce the number of customers affected by an outage.

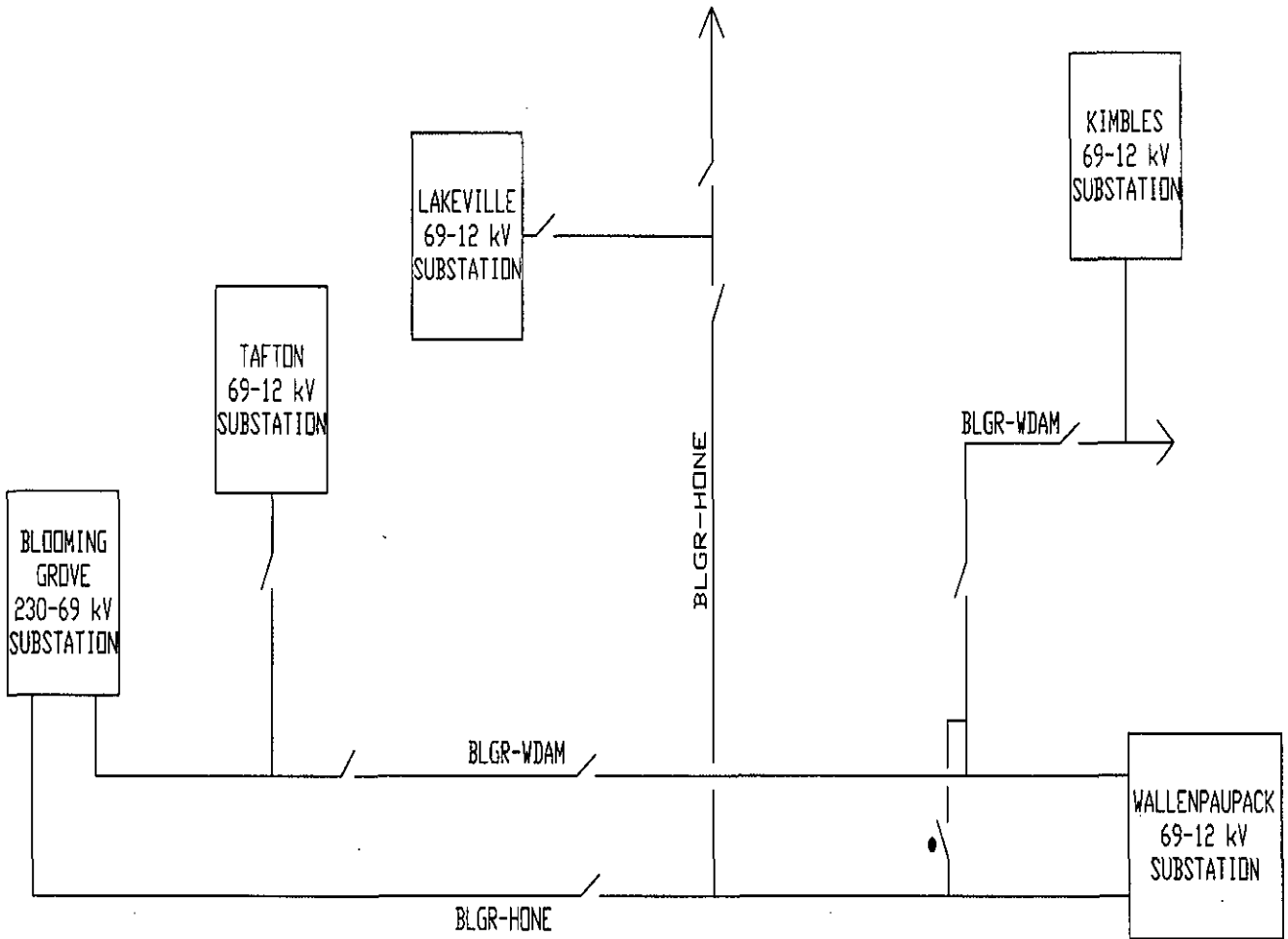
The total estimated cost of this solution is approximately \$2.1 million, which includes: \$1.2 million for the new substation; \$530,000 for the transmission line, and \$370,000 for the distribution lines. See Figure 2 for the proposed transmission system configuration and Figure 4 for the proposed distribution system configuration in this area on pages 6 and 8.

E. **FUNCTIONAL ALTERNATIVE**

An alternative to building the new substation and transmission lines would be to build a new 12 kV distribution line and terminal out of the Kimbles Substation in order to relieve the Kimbles 26-1 line. This alternative would require the new 12 kV distribution line to follow the same line route as the Kimbles 26-1 for about 2.5 miles. This does not improve reliability due to the fact that two distribution circuits installed on the same poles are susceptible to the same potential outages. Upgrades to the Kimbles Substation would also be necessary to accommodate the additional line and terminal.

PPL Electric rejected this alternative because the preferred alternative described in Section D above, provides additional reliability and operating flexibility, allows for a better long-term plan for the entire area, and avoids the investment in facilities that would be useful only temporarily. These facilities would only be temporary because projected load growth, in the area, would eventually require the installation of the substation to meet the demand.

FUNCTIONAL ONE-LINE DIAGRAM
EXISTING TRANSMISSION SYSTEM



— / — NORMALLY CLOSED SWITCH
 — / — NORMALLY OPEN SWITCH

NOTE: ONLY SELECT SWITCHES ARE REPRESENTED

FIGURE 1

FUNCTIONAL ONE-LINE DIAGRAM
PROPOSED TRANSMISSION SYSTEM

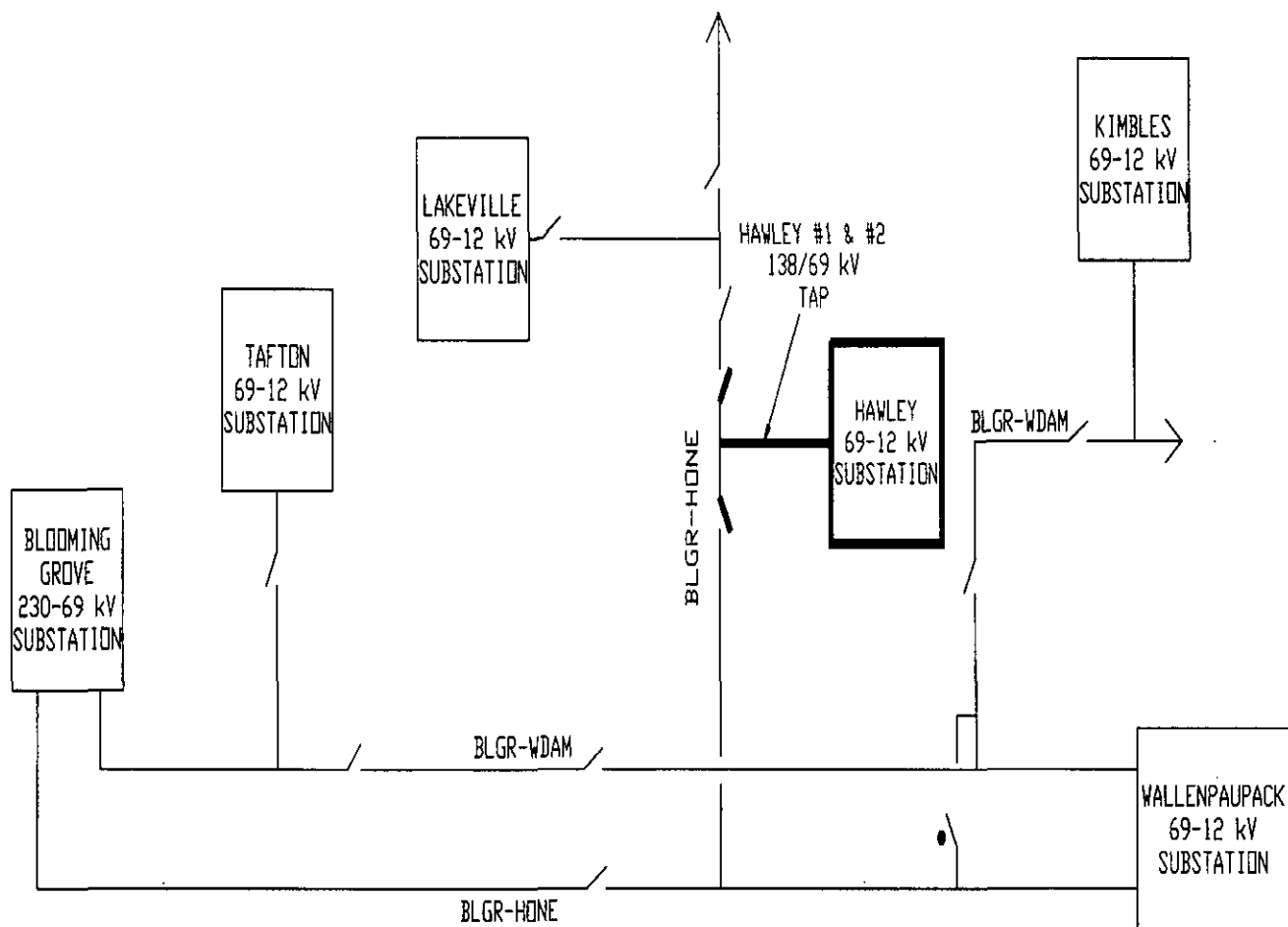


FIGURE 2

PALMYRA TOWNSHIP AREA FUNCTIONAL ONE-LINE DIAGRAM EXISTING 12 kV DISTRIBUTION SYSTEM

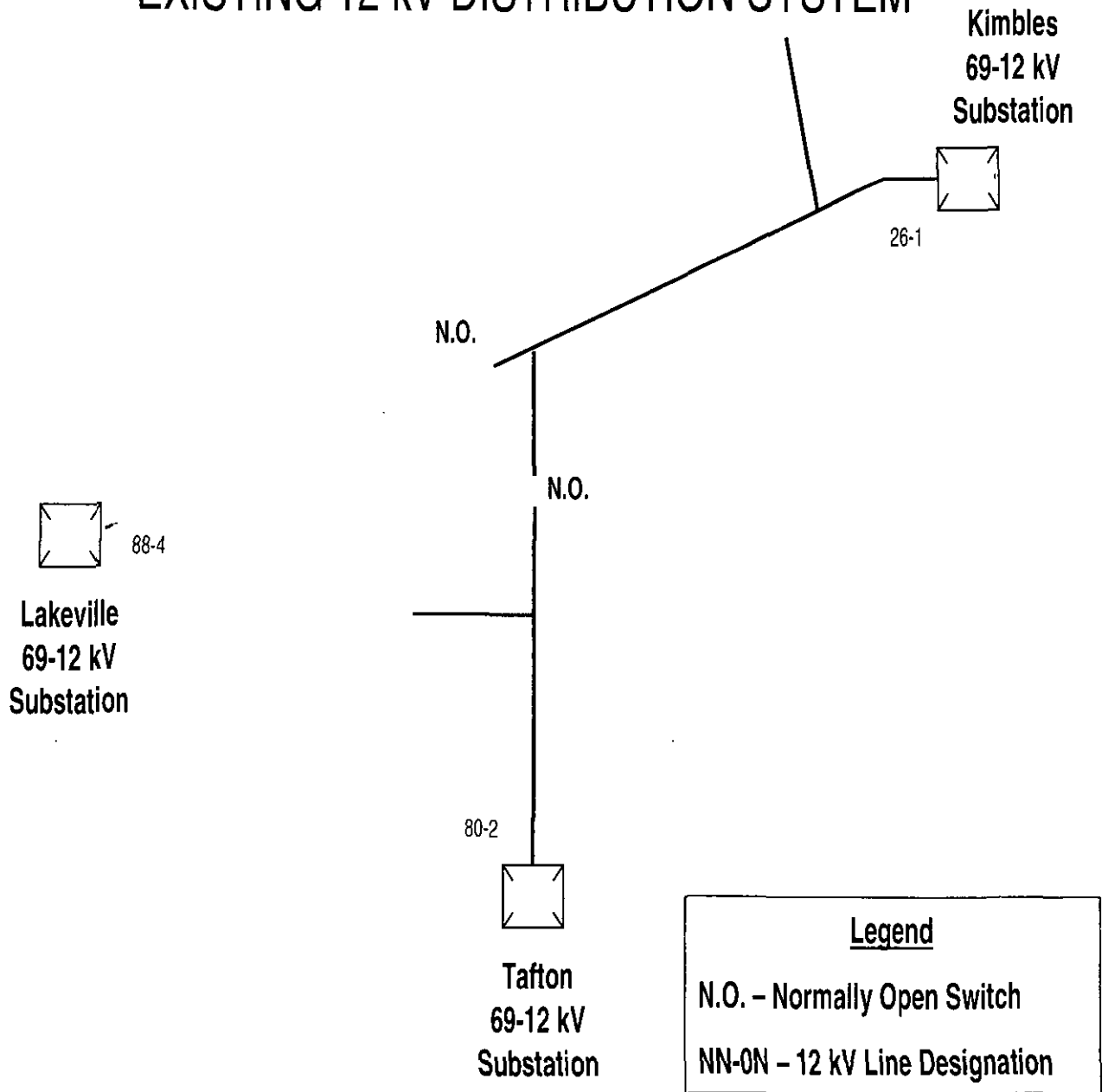


FIGURE 3

PALMYRA TOWNSHIP AREA FUNCTIONAL ONE-LINE DIAGRAM PROPOSED 12 kV DISTRIBUTION SYSTEM

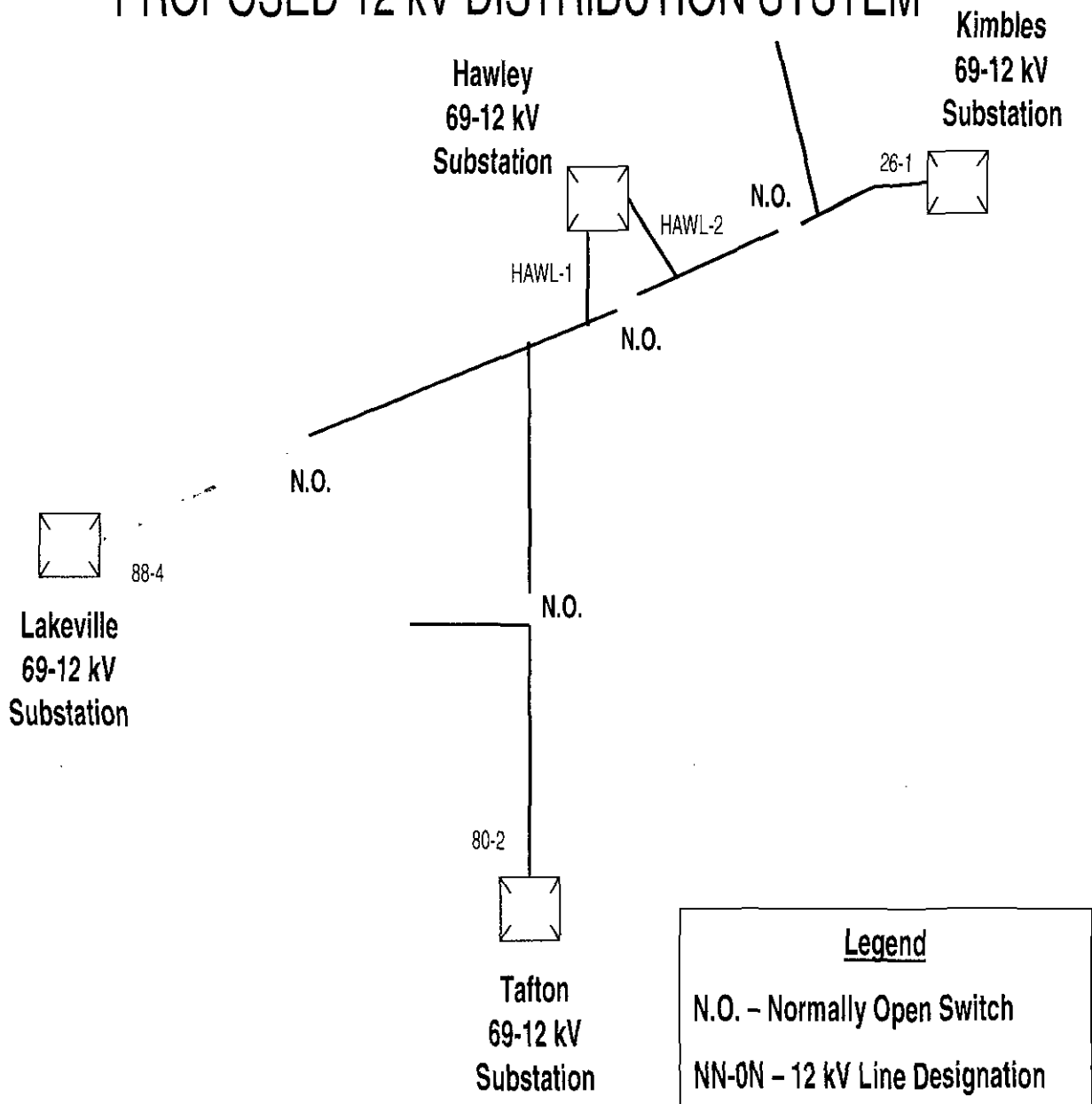


FIGURE 4

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ATTACHMENT "2"

HAWLEY #1 AND #2 138/69 kV TAP LINES

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ENGINEERING DESCRIPTION

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MAP

MAP 1	AERIAL EXHIBIT - DRAWING.....	ATTACHMENT "2" MAP POCKET
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ATTACHMENT "2"
HAWLEY #1 AND #2 138/69 kV TAP LINES
ENGINEERING DESCRIPTION

A. DESCRIPTION OF PROPOSED LINE

PPL Electric proposes to design and construct the Hawley #1 and #2 138/69 kV Taps to serve the proposed Hawley 69-12 kV Substation. The Hawley #1 and #2 138/69 kV Taps will extend from the existing Blooming Grove-Honesdale 138/69 kV Transmission Line to the proposed Hawley 69-12 kV Substation. The tap will be designed and constructed for double-circuit 138 kV operation, although initially only one circuit will be installed and operated at 69 kV. In the future, the second circuit will be installed when conditions require a second transformer at the substation. This project is located in Palmyra Township, Wayne County. Refer to the plot plan at the end of Attachment "2" which depicts the location of these facilities.

The tap lines will be approximately 250 feet in length and will consist of two poles producing two spans, each. Each span will vary in length with the shortest span being approximately 75 feet and the longest span being approximately 150 feet. The tap structure will be approximately 105 feet in height. This pole will be direct embedded and guyed. The remaining poles, excluding the two load sectionalizing air break switches (LSAB), will be approximately 65 feet in height and will be direct-embedded and guyed. In addition to the poles required for the tap to the Hawley Substation two LSAB switch poles will be installed in the existing Blooming Grove-Honesdale 138/69 kV Transmission Line. These two switch poles will be located on either side of the new tap line. The circuit will consist of three power conductors and one overhead ground wire. The power conductors will be 556.5 KCMIL 24/7 strand ACSR. A 3/8 inch steel overhead ground wire will provide lightning protection for the proposed tap line.

The new 138/69 kV tap will be designed according to, and will generally surpass, National Electrical Safety Code standards. Additional design criteria and safety rules practiced by PPL Electric are included in Attachment 4. The minimum conductor-to-ground clearance will be 30.4

feet. This minimum clearance occurs at a maximum thermal 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>Double-Circuit Design Clearance-to-Ground</u>
Normal load, average weather (16°C ambient, 60°F temperature)	30.80 feet
Predicted extreme thermal load (125°C conductor, 257°F temperature)	30.40 feet
Predicted NESC extreme wind load conditions (25 lbs., 16°C, 60°F temperature)	31.80 feet
Predicted extreme weather conditions, 0°F (1-inch ice, 4 lbs. wind, -18°C)	31.20 feet

*Clearances based on a maximum tension of 3,000 pounds and a ruling span of 75 feet.

TABLE 2
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	815
Winter Normal	10	0	926
Summer Emergency	35	1.5	1041
Winter Emergency	10	1.5	1163

B. MAGNETIC FIELD MANAGEMENT

PPL Electric's Magnetic Field Management Program is summarized in Attachment 5 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.

Increased structure height will be utilized in the design of the new line to reduce magnetic field exposures. Reverse phasing cannot be utilized initially because only one circuit will be installed. Reverse phasing requires a double-circuit line. PPL electric will evaluate reverse phasing when the second circuit is added in the future.

C. RIGHT-OF-WAY STATUS

The Hawley Substation and Hawley Taps will be constructed on a 4.00 acre parcel owned by PPL Electric. No additional right-of-way is required for the construction of the tap lines. Additionally, all right-of-way for the two new 12 kV distribution lines has been acquired.

FIGURE 1
PROPOSED 138/69 kV TAP STRUCTURE
APPROXIMATE HEIGHT - 105'
PROPOSED 138/69 kV TANGENT STRUCTURE
APPROXIMATE HEIGHT - 65'

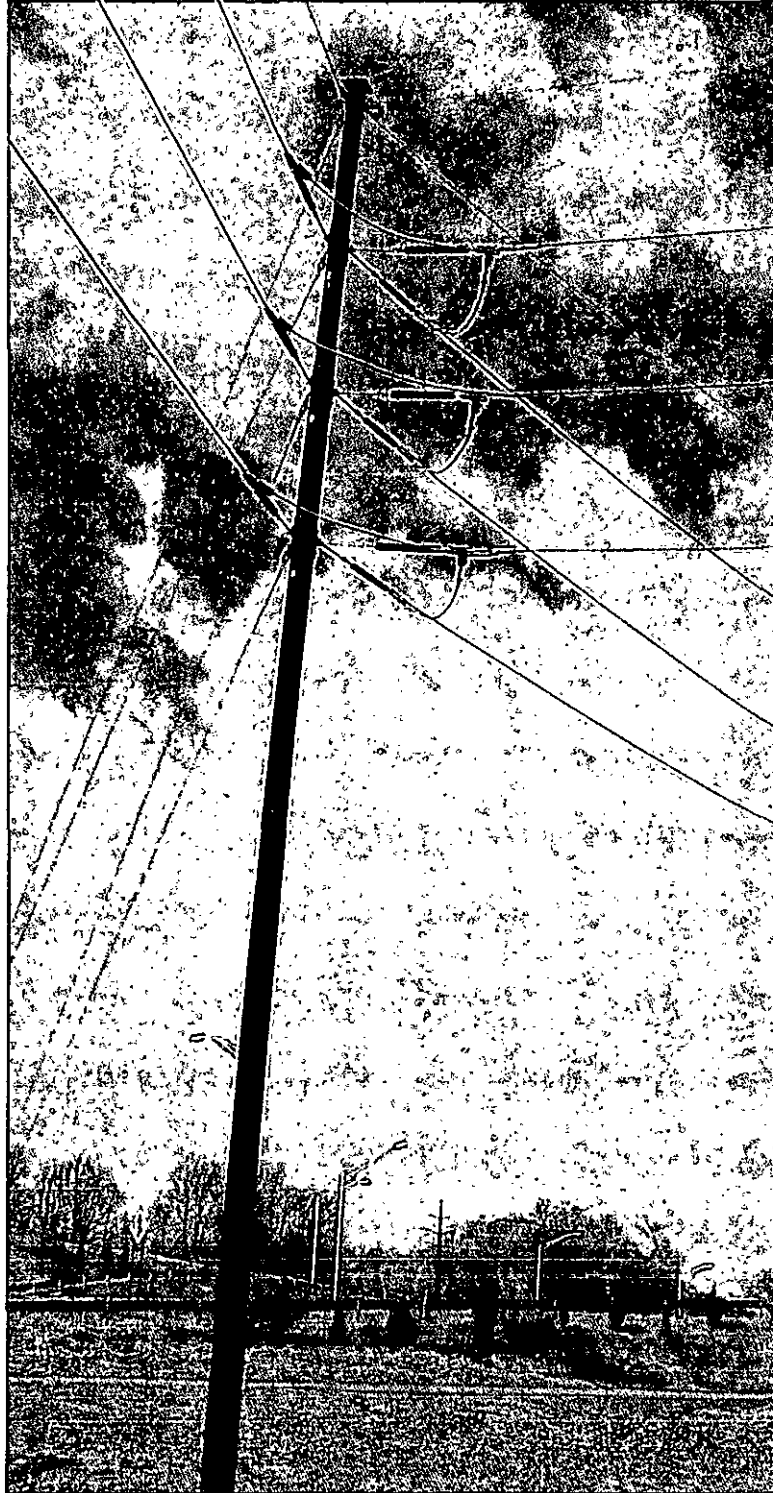


FIGURE 2
PROPOSED 138/69 kV ANGLE STRUCTURE
APPROXIMATE HEIGHT - 65'

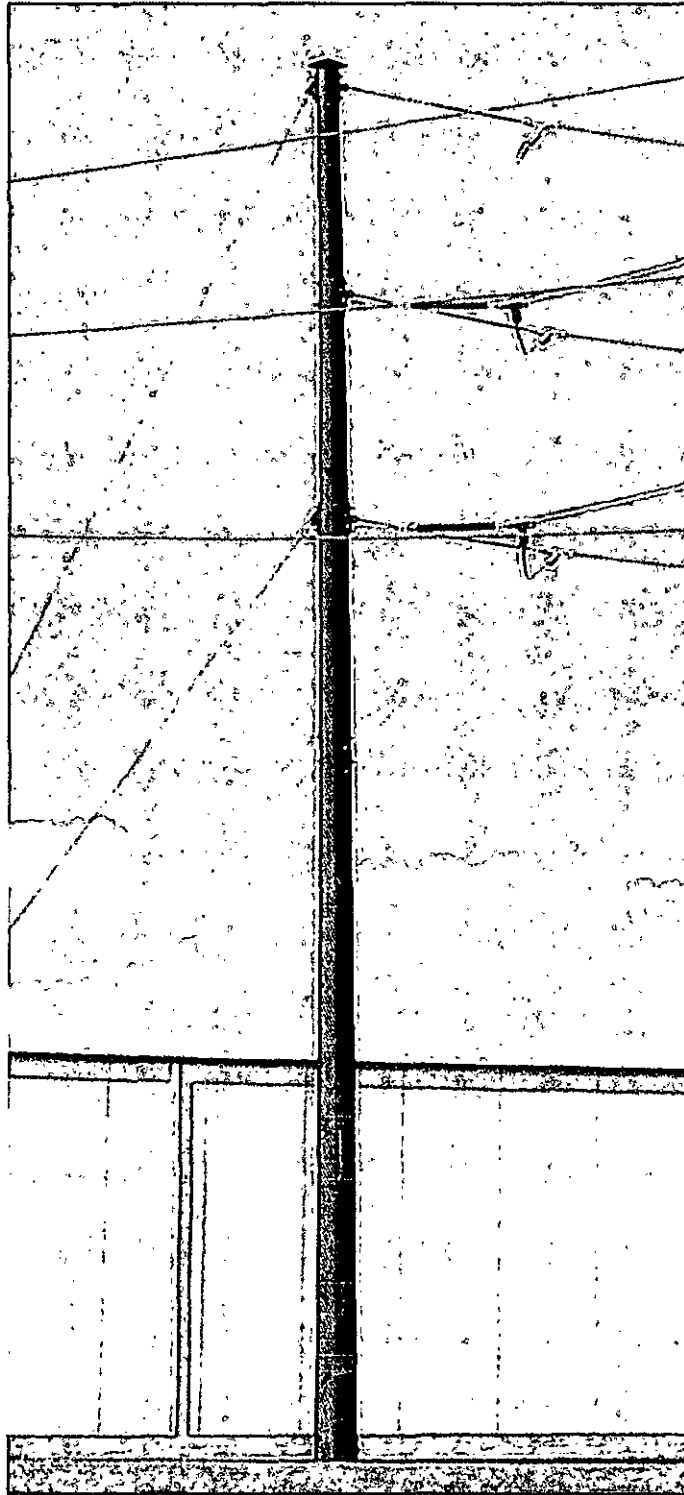
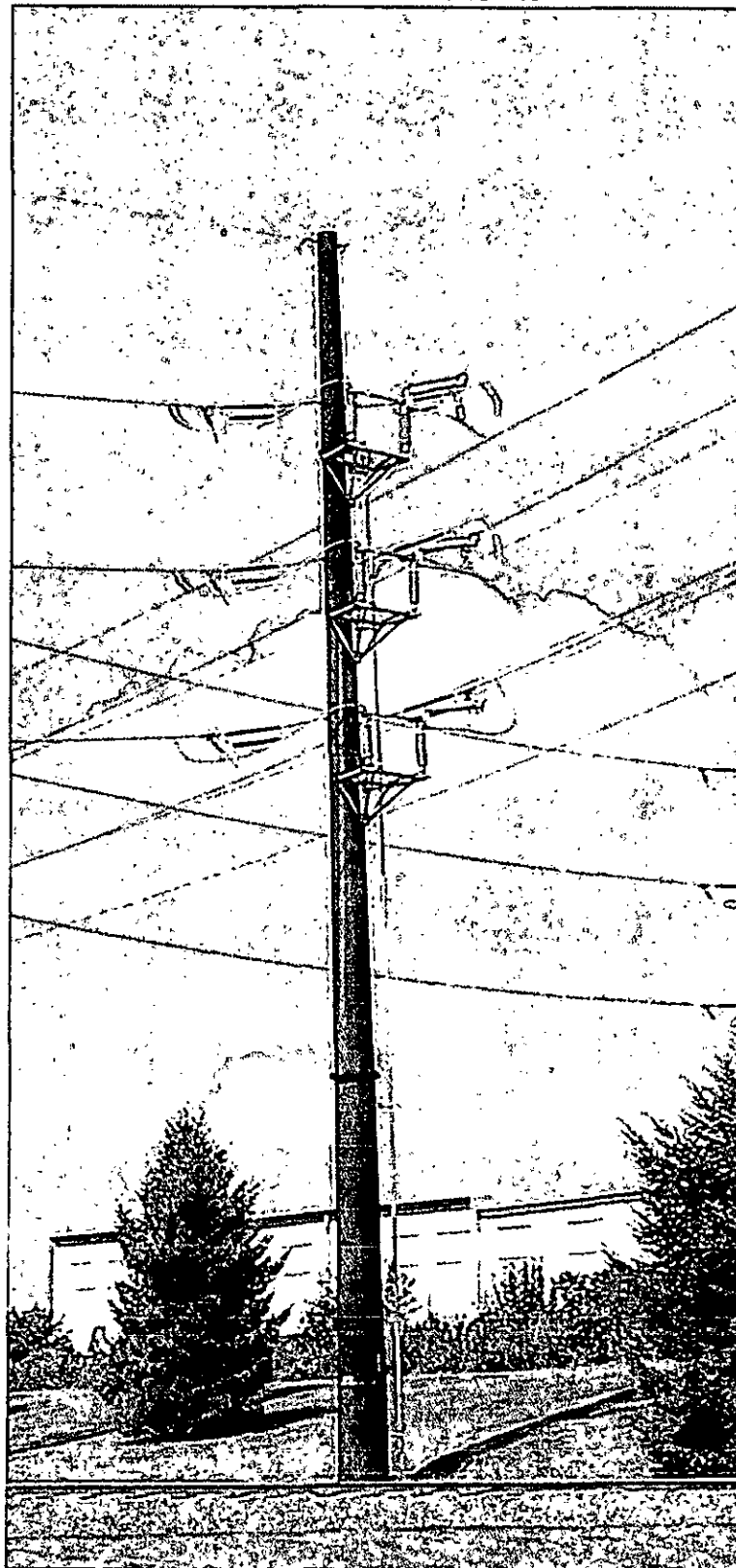


FIGURE 3
PROPOSED 138/69 kV SWITCH STRUCTURE
APPROXIMATE HEIGHT - 75'



ATTACHMENT "3"
HAWLEY #1 AND #2 138/69 kV TAP LINES
ENVIRONMENTAL ASSESSMENT

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ATTACHMENT "3"
HAWLEY #1 AND #2 138/69 kV TAP LINES
ENVIRONMENTAL ASSESSMENT

A. INTRODUCTION

To meet the increasing demand for electricity and improve reliability, PPL Electric is proposing to construct the Hawley #1 and #2 138/69 kV Taps to serve the proposed Hawley 69-12 kV Substation. The project involves the installation of approximately 250 feet of transmission line and approximately four poles. The short tap will be designed for ultimate double-circuit 138 kV operation, although initially only one circuit will be installed and operated at 69 kV. The entire project will be constructed on property owned by PPL Electric.

The proposed project was reviewed with Palmyra Township and Wayne 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 Attachment 6.

B. LAND USE

The proposed tap lines and substation are located on a 4.00 acre parcel owned by PPL Electric in the Township of Palmyra, Wayne County. The property is a wooded parcel which is zoned for Residential use and traversed by the existing Blooming Grove-Honesdale 138/69 kV Transmission Line. To the north, west, and east the property is bordered by wooded parcels. To the south, the property is bordered by a mix of wooded and commercial property. Also, PA Route 6 is located approximately 450 feet south of the property. Because of the transmission facilities that already exist in the area, the visual impacts of the project will be minimal.

The proposed lines will tap the existing Blooming Grove-Honesdale 138/69 kV Transmission Line, which traverses the site proposed for the project, and extend to the new Hawley 69-12 kV Substation.

No nearby communication towers, pipelines, or other utilities will be affected by the proposed project. Port Florence Airport is approximately 2.8 miles southwest of the project location and Cherry Ridge Airport is approximately 5.0 miles northwest of the project location. PPL Electric will file the appropriate documentation with both the Federal Aviation Administration and the PennDOT Bureau of Aviation to ensure the proposed tap line will not be a hazard to the airports' flight operations.

C. CULTURAL RESOURCES

The project was reviewed by the Pennsylvania Historical and Museum Commission (PHMC). The PHMC has determined that there are no National Register eligible or listed historic or archaeological properties in the area (File No. ER 2009-1044-127-A). Therefore, there are no anticipated impacts to such resources and no further investigations are required.

D. NATURAL FEATURES

The project will not affect any unique geological, scenic, or natural areas. The recreational areas located closest to the project are Lake Wallenpaupack and Pennsylvania State Game Lands Number 183. Lake Wallenpaupack is located approximately 0.50 miles south of the project location and Pennsylvania State Game Lands Number 183 is located approximately 1.00 mile east of the project location. There are no anticipated impacts to these features due to the distance from the project area, development between the project area and the features, and the small project size.

Tree clearing is required and PPL Electric will apply its "Specifications for Initial Clearing and Control of Vegetation on or Adjacent to Electric Right-of-Way Through Use of Herbicides, Mechanical, and Hand Clearing Techniques" to mitigate impacts. The transmission tap lines will not cross any wetlands or areas designated as "Waters of the U.S." or "Waters of the Commonwealth". PPL Electric will acquire and comply with any required soil erosion and sedimentation control permit conditions. Additionally, any

required permits will be obtained from the Pennsylvania Department of Environmental Protection and the United States Army Corps of Engineers prior to construction and PPL Electric will comply with all conditions placed on the permits.

E. **THREATENED AND ENDANGERED SPECIES**

PPL Electric has coordinated with different state and federal agencies to obtain information regarding threatened and endangered species in close proximity to the project area. A review of the Pennsylvania Natural Diversity Inventory (PNDI) records indicates that there are no anticipated impacts to threatened and endangered species and/or special concern species and resources (PNDI Search ID: 20100318234564).

LIST OF SUPPLEMENTAL ATTACHMENTS

ATTACHMENT "4" PPL Design Criteria and Safety Practices
ATTACHMENT "5" PPL Magnetic Field Management Program
ATTACHMENT "6" List of Involved Governmental Agencies, Municipalities
and Other Public Entities

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ATTACHMENT 4

PPL ELECTRIC 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 Electric) 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 Electric 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 Electric 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 Electric 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 Electric 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 Electric lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL Electric transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL Electric 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 Electric 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 Electric 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 Electric 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 Electric 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.



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**MAGNETIC
FIELD
MANAGEMENT**
PPL Electric Utilities
Corporation

ATTACHMENT 5

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

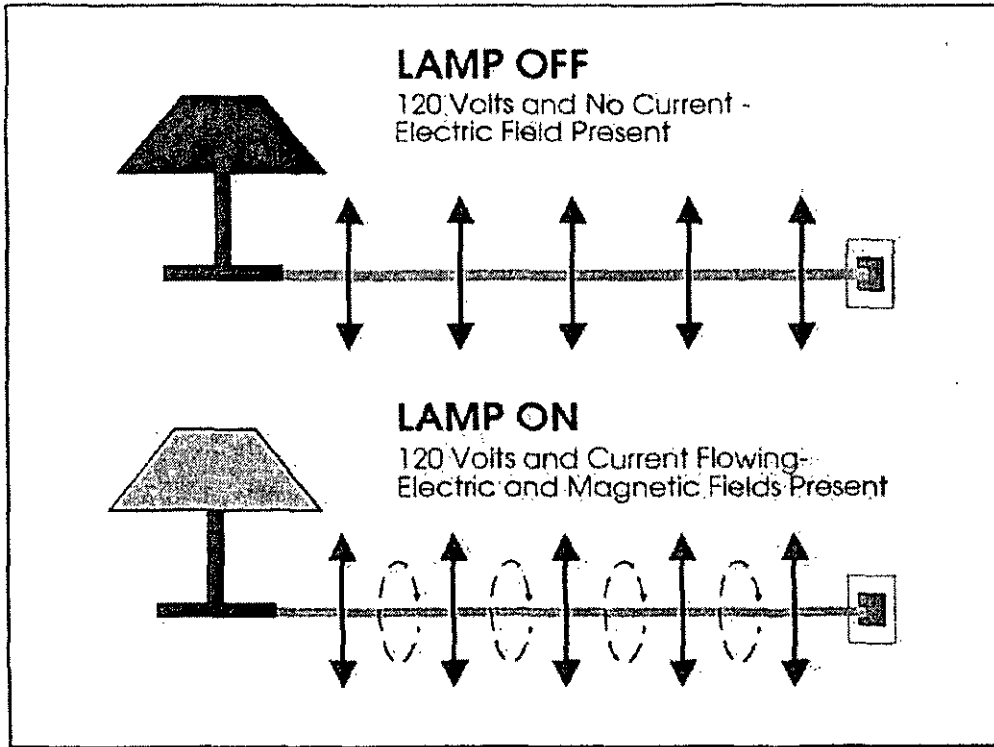


Figure 2









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.

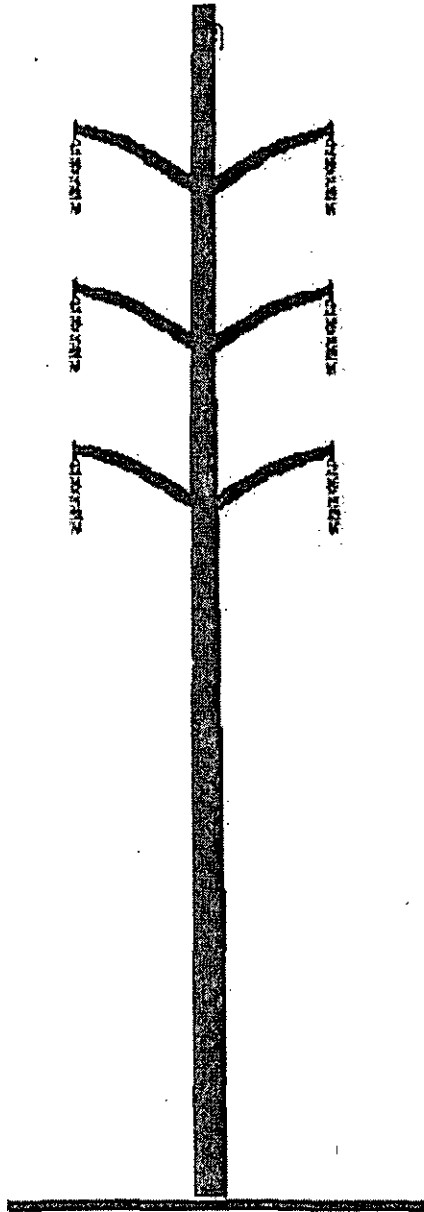
- Main lines are the most heavily loaded sections of a distribution line and therefore have the highest magnetic fields associated with them.
- Increasing the ground clearance by five feet reduces the magnetic field under the line from 14 mG to 11 mG using the standard eight-foot crossarm design. These 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.

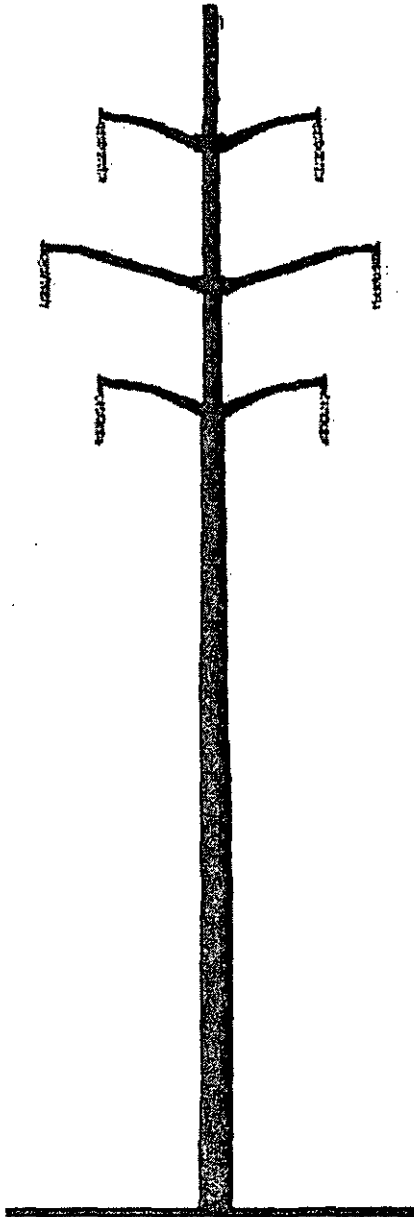
- The phase arrangement that produces the lowest field will be determined.
- The depth of burial of the line will be determined considering the cost of excavation and the location of other buried utilities in the area.
- The use of steel pipe ferromagnetic shielding that reduces magnetic fields will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



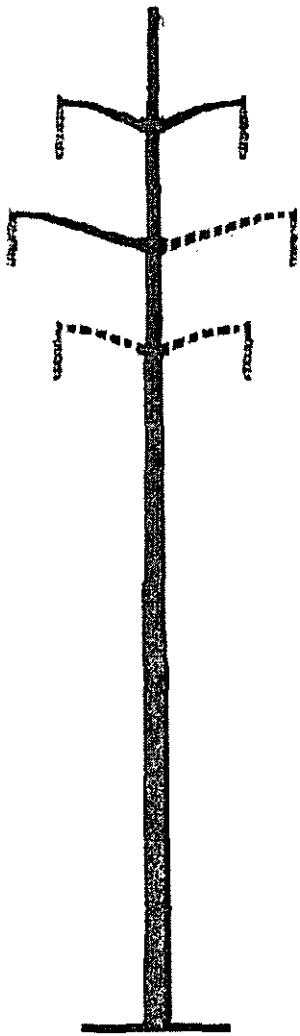
- Lower cost alternative
- Reduces magnetic fields due to higher structures
- Typical conductor data:
 - 1 3/8" HS steel overhead ground wire - 17.3 feet sag
 - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 23.0 feet sag
 - Average span - 600 feet

**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.

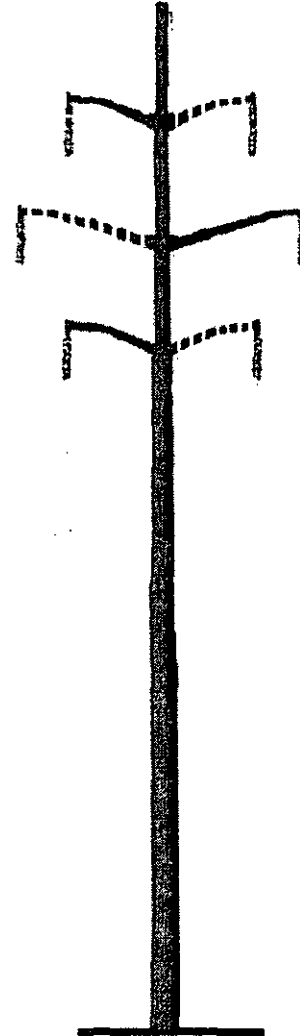
Typical Single-Circuit Structure Designs



Top/Middle



Vertical



Top/Middle/Bottom

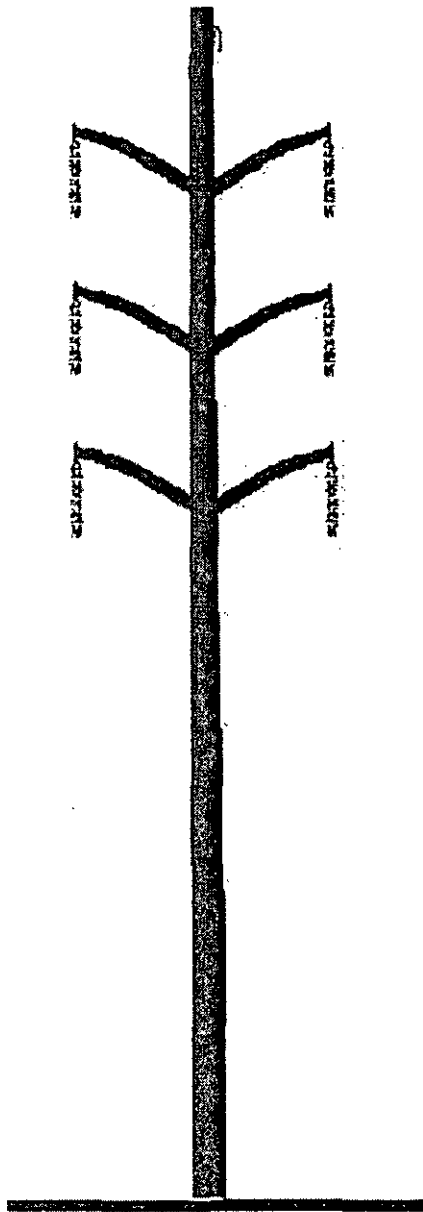
——— initial single circuit
- - - - - future second circuit

**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

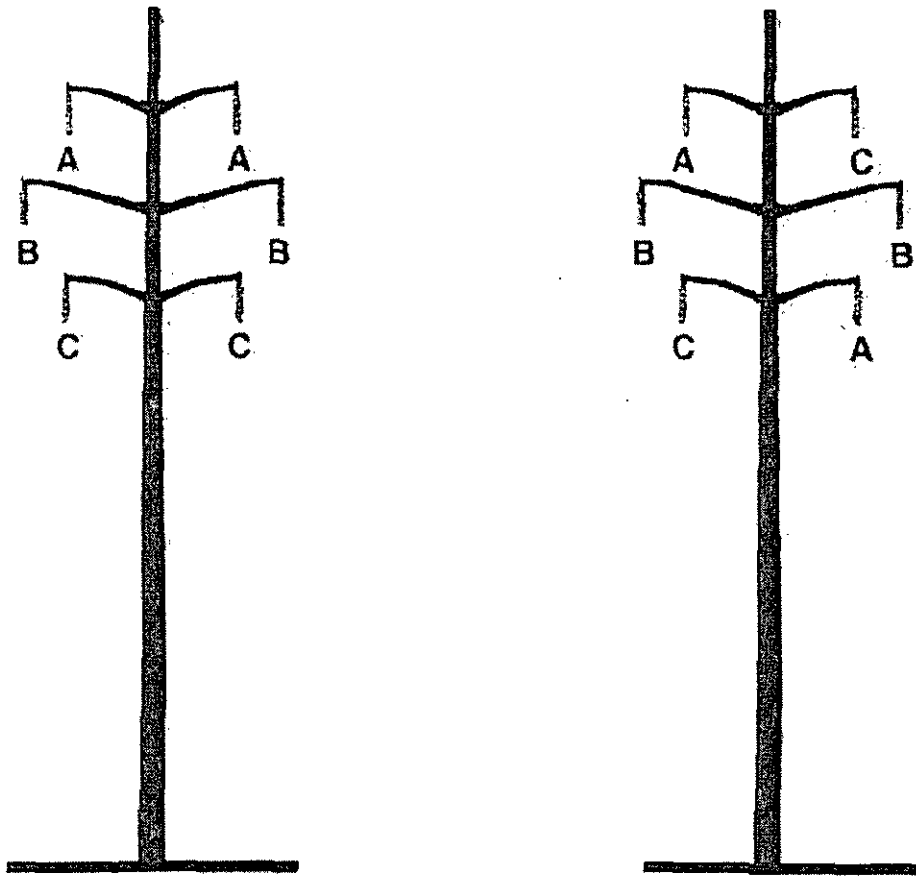
The edge of right of way is 50 feet from the line centerline.
The 400 ampere phase current is balanced between phases.
Calculations are based on a minimum ground clearance of 25 feet.

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: $\longrightarrow \longrightarrow \longrightarrow \longrightarrow$ 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.

ATTACHMENT 6

**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. McLearen, 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

Wayne County Commissioners
925 Court Street
Honesdale, PA 18431
Attn: Brian W. Smith, Chairperson

Wayne County Planning Commission
925 Court Street
Honesdale, PA 18431
Attn: Edward J. Coar, Director

Palmyra Township Board of Supervisors
219 Oak Street
Hawley, PA 18428
Attn: Lois Powderly, Secretary

Palmyra Township Planning Commission
219 Oak Street
Hawley, PA 18428
Attn: Lois Powderly, Secretary

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APR 26 2010

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

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, Second
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: The Honorable Allen D. Biehler, P.E.,
Secretary

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

Wayne County Commissioners
925 Court Street
Hawley, PA 18431
Attn: Mr. Brian W. Smith, Chairperson

Wayne County Planning Commission
925 Court Street
Hawley, PA 18431
Attn: Mr. Edward J. Coar, Director

Palmyra Township Board of Supervisors
219 Oak Street
Hawley, PA 18428
Attn: Ms. Lois Powderly, Secretary

Palmyra Township Planning Commission
219 Oak Street
Hawley, PA 18428
Attn: Ms. Lois Powderly, Secretary

Date: 4/26/10



Christopher T Wright

SECRETARY'S BUREAU
2010 APR 26 PM 3:51
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**NO SCANNED IMAGES ARE
AVAILABLE FOR OVERSIZED
MAPS OR PLANS**

**MAPS AND PLANS
MAY BE VIEWED IN THE
COMMISSION'S
FILE ROOM**