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FEDERAL EXPRESS

October 2, 2012

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
Harrisburg, Pennsylvania 17105-3265

Re: **PPL Electric Utilities Corporation**
Biennial Inspection, Maintenance, Repair and Replacement Plan
For the Period January 1, 2014 – December 31, 2015
Docket No. M-2009-2094773

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation ("PPL Electric") are an original and six (6) copies of PPL Electric's Biennial Inspection, Maintenance, Repair and Replacement Plan for the Period January 1, 2014 – December 31, 2015 ("I&M Plan"). PPL Electric's I&M Plan is being filed pursuant to the Commission's regulations at 52 Pa. Code §§ 57.191, et seq.

Pursuant to 52 Pa. Code § 1.11, the enclosed document is to be deemed filed on October 2, 2012, which is the date it was deposited with an overnight express delivery service as shown on the delivery receipt attached to the mailing envelope.

In addition, please date and time-stamp the enclosed extra copy of this letter and return it to me in the envelope provided.

If you have any questions, please call me or Stephen J. Gelatko, PPL Electric's Manager –Distribution Asset Management at (610) 774-4785.

Very truly yours,

Paul E. Russell

Paul E. Russell

Enclosures

cc: Mr. Darren Gill
Ms. Yasmin Snowberger
Irwin A. Popowsky, Esquire
Steven C. Gray, Esquire

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Biennial Inspection, Maintenance, Repair and Replacement Plan of PPL Electric Utilities Corporation

For the Period of January 1, 2014 – December 31, 2015

Submitted by:

Stephen J Gelatko

Stephen J. Gelatko
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Dated: October 2, 2012

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Introduction

PPL Electric Utilities Corporation ("PPL Electric") is firmly committed to maintaining high levels of customer satisfaction. Customer surveys repeatedly have demonstrated that successful achievement of high levels of customer satisfaction depends upon providing acceptable levels of reliability performance coupled with a reasonable cost of providing service.

PPL Electric has established a strong, long-term record of customer satisfaction and electric reliability. PPL Electric has earned eighteen J. D. Power and Associates awards – more than any other investor-owned utility in the country – since J. D. Power and Associates began studying customer satisfaction among electric utility customers. PPL Electric has ranked highest among utilities in the eastern U.S. in J. D. Power and Associates' annual study of residential customer satisfaction nine times, in 1999 and from 2001-2007 and 2012. In February 2011, PPL Electric ranked highest among utilities in the eastern U.S. in J. D. Power and Associates' annual study of business customer satisfaction. PPL Electric came in second place on the business study in February 2012 and has a total of 9 business awards in 13 years of the study.

Ultimately, all of the costs of maintaining reliability are borne by the ratepayers. Therefore, managing finite resources to produce optimal results is essential to maintain customer satisfaction. The criteria for program inclusion is not whether any given activity produces a positive reliability result, but, rather, what portfolio of activities produces the best result for a given expenditure of resources given the specific reliability challenges faced by PPL Electric at this point in time and for the foreseeable future.

PPL Electric's goal is focused on results (i.e., the reliability experienced by customers), not the rote execution of particular tasks.

Reliability results from a mixture of manageable and unmanageable factors. The most notable of the unmanageable factors is the frequency and severity of weather events, which can vary dramatically over time and geography. The manageable factors have an effect on service interruption frequency, duration, or number of customers affected, or a combination of all three. Figure 1 depicts a portfolio of manageable factors with I&M practices being one of many.

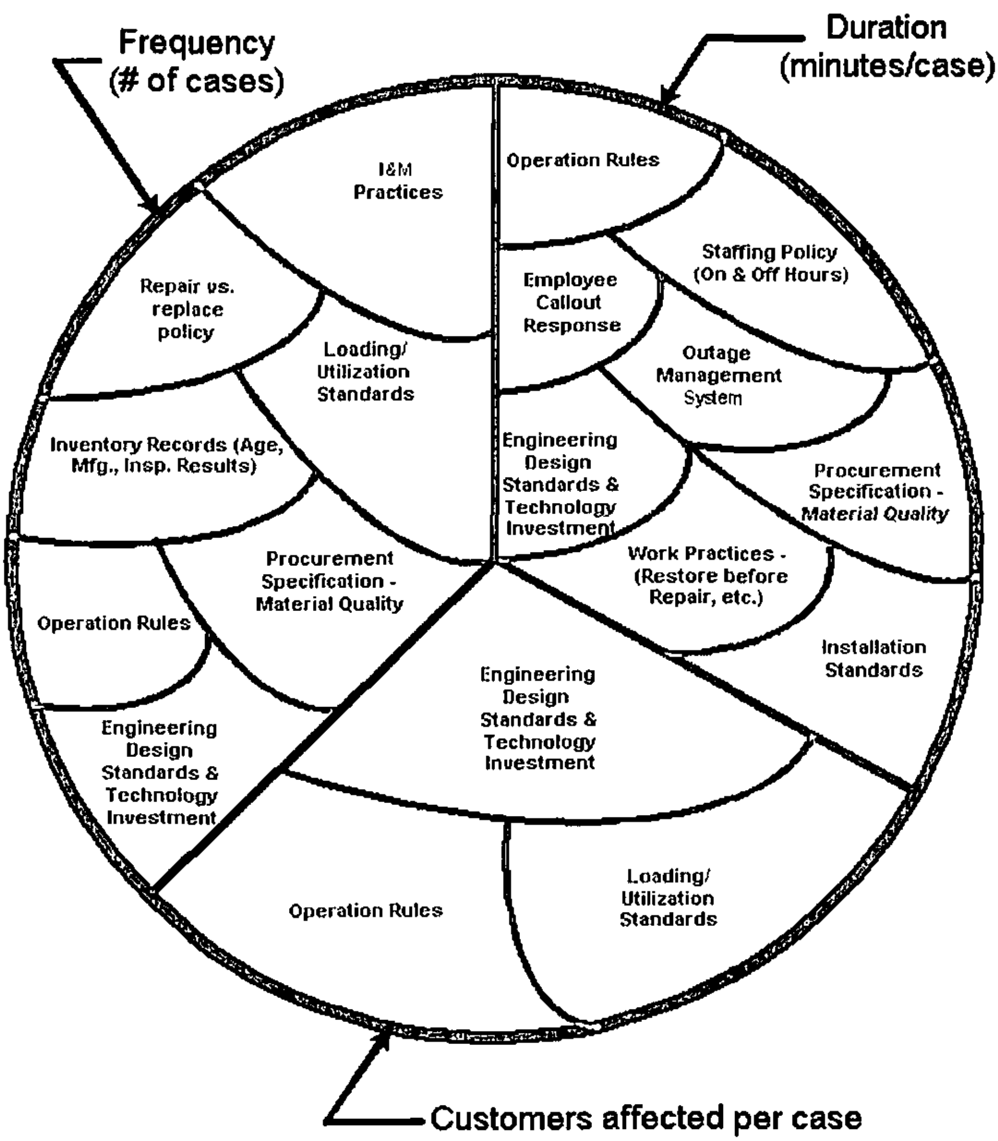

Figure 1: Reliability Programs and Policies

Examples of PPL Electric initiatives addressing each of the three reliability sectors are:

Duration (minutes/case)

- **Mobile Operations Management ("MOM"):** A three-year $12 million project (completed in October 2009), which equipped most Distribution Operations vehicles with laptop computers and software, that provides crews with their work for the day, as well as access to maps, directions, transmission and distribution system information, and more. The real-time view of field work, assisted by built-in GPS capability, means more timely and accurate dispatching and job tracking. In addition, as work is completed, the priorities of remaining work are readjusted to ensure that the next job also is the most critical.

- **Automated Callout:** In the 4th quarter of 2008, Distribution Operations implemented a new automated system to call employees into work for after-hours emergencies. The system shortens response time under storm conditions when large numbers of employees must be called out to restore service to customers. Another advantage of the new system is that managers in the field can immediately see on a computer screen the progress of the call outs and adjust accordingly.

- **Outage Management System (OMS) enhancements:** During 2011, enhancements were made to help ensure more accurate service outage data and more efficient processing of service outage data during large storm events:

    - OMS hardware and the OMS database version was upgraded to enhance processing and memory.

    - Large-scale storm Estimated Restoration Time (ERT) enhancements were completed.

    - The OMS database was tuned to speed up overall processing and user interface.

- **Storm Central:** In the 4th quarter of 2009, PPL Electric implemented a new one-stop-shopping storm management site – Storm Central – that allows for faster, easier and more efficient operations. The site uses SharePoint software that provides extensive collaboration capability and content management. Storm Central's home page provides PPL Electric employees with a view of several critical areas, including a service outage map, work crew status, manpower status, live weather radar, and projected storm service outages and restoration times. Additionally, during 2011, PPL Electric updated and revised its Emergency Response Plan. The primary objectives of the Plan are to:

    - Document the processes for the electric delivery system restoration under different levels of emergency or disaster conditions.

    - Identify the threshold for expanding participation in the event beyond a few key organizations and into a structured process shared by the entire PPL Electric organization.

- Streamline the restoration of services and provide better restoration information to customers.

- Refine roles and accountabilities.

- Refine the feedback mechanism for assessing restoration performance following an event and allow for improved continuous adjustments.

- **Distribution Automation:** In 2010, PPL Electric launched a "smart grid" pilot project that enables the Company to move power more efficiently, react instantaneously to changes on the delivery system, and automatically re-route power around problems that occur. The project focused mainly on the Harrisburg, Pa. area, although all customers will benefit from the introduction of a new centralized distribution management system. Future plans include the installation of hundreds of automated electrical devices through 2018. PPL Electric will upgrade approximately 146 substations and 543 circuits, and will create a secure wireless communications network. The end-result will be a delivery system that operates more efficiently, recognizes problems immediately, and responds in seconds to restore the service for many customers who otherwise need to wait minutes or hours. The project builds upon PPL Electric's prior installation of advanced meters throughout its service area.

- **Fault Indicator Installation at Load Break Air Switches ("LBAS"):** Strategically placed fault indicators assist responders to cases of trouble to quickly identify the location of faulted equipment, reducing service outage time, reducing restoration costs, and improving customer service. Fault indicators have been installed or replaced at most of its 3,100 Load-Break Air Switch ("LBAS") locations in a two-year program (2011-2012) to standardize the type and settings of fault indicators at all LBAS locations.

- **Circuit SAIDI initiative:** This project includes the installation of reclosers and air breaks with communications capabilities or the upgrade of existing reclosers and air breaks to include communication capability. Such installations allow for remote operation and monitoring of circuit sectionalizing equipment. This program also includes installation of manual switches to address emergent reliability issues. The results of these improvements are threefold:

  - Reduce the number of upstream customers affected by a service outage.

  - Reduce the time necessary to restore customers by transferring circuit sections to alternate sources and limiting long-duration service outages to smaller circuit sections involving fewer customers.

  - Facilitates fault location and reduces the time necessary for repair and restoration.

- **Smart Meter Technology:** PPL Electric is a national leader in the use of advanced metering technology for the benefit of customers, having installed an advanced metering system for all customers between 2002 and 2004. The Company has used the technology to improve the efficiency of responding to service outages – especially during storm emergencies – and as a tool for reliability planning. PPL Electric has researched advanced methods to pilot a mechanism to proactively submit a service outage without having to rely on a customer to report it. The proactive outage detection pilot currently is in testing and deployed in production for a limited number of feeders. The pilot will run through the remainder of 2012. Full implementation will depend upon successful pilot results and tentatively is planned for 2013.

- **Respond to Customer Organization**: In the first quarter of 2009, a new Restore the Customer organization was established to be responsible for the initial response to service outages and other service problems. The RTC organization includes Emergency Planning and Distribution System Operations, Facility Records and System Dispatch. The RTC group is focused on restoring customers more quickly and improving PPL Electric's response time.

Customers affected per case

- **Expanded Operational Reviews ("EOR"):** EORs are performed on each feeder on a four-year cycle. The review addresses both operational and reliability characteristics of each circuit. Voltage support, phase balancing, power factor maintenance and loading issues are addressed from an operational perspective. Service outage analysis, exposure analysis and a field check address reliability.

- **Reliability Principles and Practices ("P&P") Revisions:** In June 2011, PPL Electric's Reliability Principles and Practices (P&P) were revised to help reduce the overall impact to our customers from outages due to various causes, including but not limited to, equipment failures. The P&P sets forth a set of Principles that PPL Electric follows to plan, protect and operate the Electrical Distribution System ("EDS"). These Principles are implemented through a set of standard Practices that are used as guidelines in designing the EDS. These Practices are considered reasonable, acceptable and align well in accordance with good utility practices. More specifically, to reduce the number of customers experiencing permanent service outages and service outage duration over the long-term, the following circuit design guidelines are used starting with those identified as Worst Performing Circuits ("WPCs"):

  - Limit the line length to approximately 50 circuit miles.
  - Limit customer count to less than 1,300 customers per circuit.
  - Ensure the circuit has three-phase tie lines, and these tie lines will support the transfer of 50% of the customers for at least 95% of the hours in a year.
  - Use line automation to restore at least 50% of the customers by System Operator-controlled switching or automated switching.

Frequency (# of cases)

- **Asset Optimization Strategy ("AOS"):** In 2008-2009, PPL Electric conducted a major condition assessment and maintenance study of its distribution system involving individuals from the Distribution, Protection and Control, Substation and Reliability groups. This project was initiated to identify and address the challenges created by the Company's aging infrastructure. The objectives were to assess equipment health in seventeen distribution asset classes comprising approximately 30,000,000 units of equipment, and generate a strategy for capital replacements and maintenance improvements to address these challenges.

- **Long Term Infrastructure Improvement Plan:** PPL Electric currently is undertaking the development of and implementation of a Long Term Infrastructure Improvement Plan. The Plan is a continuation of AOS infrastructure replacements in addition to prudent capital investments such as the proactive installation of animal guards, new sectionalizing devices, distribution automation, asset life extension methods, replacement vs. repair of failed equipment, and capital projects aimed at WPCs. *The investment is expected to mitigate the growth in equipment failure projections in the* short-term and eventually reverse the trend in the long-term. Equipment failure trends, in addition to asset specific contribution to system level metrics, are analyzed on an ongoing basis to ensure funding is invested appropriately. The Plan is being submitted pursuant to the requirements of Subchapter B, Distribution Systems, of the Public Utility Code, 66 Pa.C.S. §§ 1350-1360, and the Public Utility Commission's ("PUC") Implementation Order for Establishment of a Distribution System Improvement Charge.
- **Customers Experiencing Multiple Interruptions ("CEMI") Program:** The CEMI Task Force and Program was established in 2009 with the goal of preventing or reducing the number of customers experiencing multiple service interruptions to less than ten per year, as well as to communicate in an effective and timely manner with these customers when service interruptions occur. CEMI performance is monitored closely by regional distribution planners and reliability supervisors to identify cost-effective solutions that are submitted to the CEMI Task Force. The Task Force maintains a prioritized list of approved submitted projects based upon prior year CEMI results and authorizes projects based upon available funding.

  The CEMI program is structured around three key attributes:

  - Anticipate – analyze, predict and attempt to prevent multiple service interruptions from occurring.

  - Mitigate – when multiple service interruptions occur, determine root causes, develop solutions, and ultimately implement corrective actions to help in reducing the risk of future service interruptions.

  - Communicate – following multiple service interruptions, contact customers to inform them that PPL Electric is aware that a service interruption has occurred, provide the cause of the service interruption and its plans to prevent future service interruptions, among other pertinent details. In addition, when solutions are implemented, contact customers and advise them of the improvements made.

- **Distribution and substation animal guarding:** Two new programs were established in 2009 to install animal guards on distribution overhead transformers and switches in locations with a high density of animal-related service outages since 2002, and to install animal guard materials at all distribution substations by 2017.

- **Inspection and maintenance practices and programs (highlighted in Figure 1)** focus on equipment performance and service interruption avoidance. The scope of these maintenance programs, procedures and activities covers all areas of the electrical infrastructure.

These practices and programs include:

Transmission
Transmission inspection programs include aerial patrols and wood pole inspection, treatment and replacement. The patrols focus on comprehensive inspections, routine inspections and identification of emergency work. The patrols include inspection of all equipment, including poles, arms, line switches, interrupters, arresters, grounding, guying, anchors and other key transmission components.

Substation
Substation maintenance programs include inspections, condition testing and preventative maintenance of equipment, such as power transformers, circuit breakers, disconnects, power cables, and security equipment. Some equipment is maintained on a time basis; other equipment is condition monitored. These two methods help ensure that maintenance work is performed in a timely manner. In addition to time and condition-based maintenance, thermo-graphic inspections help to ensure that substation equipment does not operate at elevated temperature levels for an extended period of time, which could lead to premature failures.

Distribution
Distribution encompasses many maintenance aspects similar to transmission and substations, and also includes load surveys that help engineers to determine peak load requirements, circuit analyses that help engineers to identify lines requiring maintenance work, voltage relief, or other capital improvements. Overhead line inspections identify the weak links in the system so that damaged or deteriorated equipment can be repaired or replaced. In addition, distribution maintenance includes inspections of poles, voltage regulators, line switches, capacitors, and other key distribution equipment. PPL Electric also tests underground cable for integrity to determine if the cable needs to be replaced, repaired or cured to prevent future failures.

Vegetation
The vegetation on PPL Electric's transmission and distribution rights-of-way is maintained utilizing a combination of several management techniques. These include tree pruning, tree removal, reclearing and herbicide application. Lines are field-surveyed on a regular basis. The work is prioritized based on the conditions observed and past performance.

Each of these programs is more fully described in Appendices A through D.

PPL Electric Reliability Results

The reliability planning process employed by PPL Electric has been very effective, as evidenced by its reliability performance generally is being maintained at the benchmark levels and below the standards that existed prior to the Electricity Generation Customer Choice and Competition Act ("Customer Choice Act"), while preserving a reasonable cost of providing service.

Unprecedented storm experience during 2011 severely distorted reliability performance. Such storm activity negatively impacted an increasing SAIDI trend and slowed a decreasing SAIFI trend.

Table 1: PPL Electric Reliability Metrics

	PUC Benchmark	PUC 36-Month Std	PUC 12-Month Std	1999-2011 Avg. (Since benchmark period)	2009-2011 3 Yr. Avg.
SAIFI	0.98	1.08	1.18	1.03	1.01
SAIDI	142	172	205	145	138
CAIDI	145	160	174	139	134

PPL Electric Reliability Planning Process

PPL Electric's process is forward-looking and proactive. It consists of the following:

- Analyze the historical trends of causes of service outages and other power service problems.
- Identify the drivers of those trends.
- Forecast future reliability metrics (SAIDI, SAIFI, and CAIDI) given existing mitigation programs' effect on the identified drivers.

- Identify new programs, policies and activities to add to or substitute for existing mitigation programs to avoid any forecasted gaps between future reliability and the desired levels.

- Identify, evaluate and implement new technologies that enhance its condition monitoring strategy

- Continually evaluate and adjust programs, policies and activities to produce the desired future results.

- The resulting portfolio of existing and new programs, policies and activities are incorporated in PPL Electric's five-year business plan.

- This I&M Plan is a subset of PPL Electric's five-year business plan.

PPL Electric Reliability Analysis

Identification and understanding of trends creates the opportunity to plan programs to mitigate undesirable trends. Most of the year-to-year variation in service interruptions is explained by differences in storm experience. Therefore, PPL Electric removes storm caused service outages and analyzes the remaining "blue sky" or "normal operations" data to identify other causal trends affecting reliability. Each data point in the following charts represents a 12-month ending value to eliminate the effect of seasonal variation.

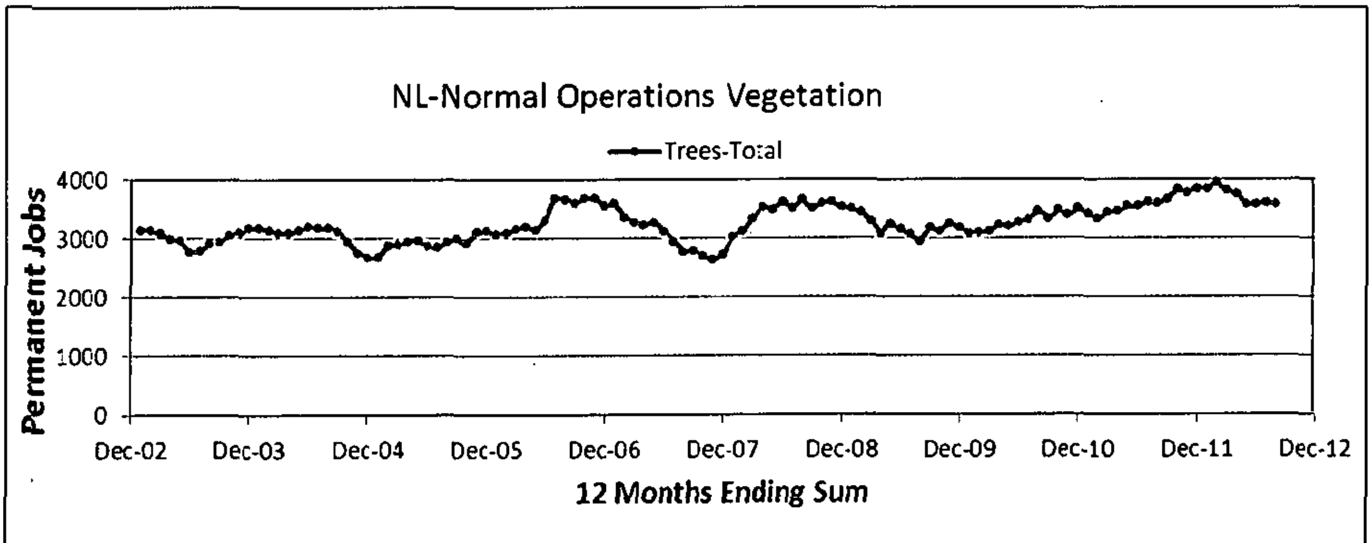

Figure 2: Vegetation Related Service Interruption Cases

Figure 2

The long-term trend in tree-related outages has been climbing, but recently is trending downward due to an increased focus on, and additional funding for, tree-trimming. Weather plays a larger role with vegetation-related service interruptions than other causes: approximately 24% of normal operation service interruptions are due to vegetation, but about 54% of non-reportable storm service interruptions, about 78% of reportable storm service interruptions and about 84% of major event service interruptions are vegetation-related.

A significant risk to PPL Electric's ability to meet reliability benchmarks is the large portion of distribution facilities, which were installed in the 1960's and 1970's, that are now beyond or nearing the end of their design lifetime. See Appendix A for average age of major units of property. The resultant effect on non-storm-related equipment failure is illustrated by the chart in Figure 3 below.

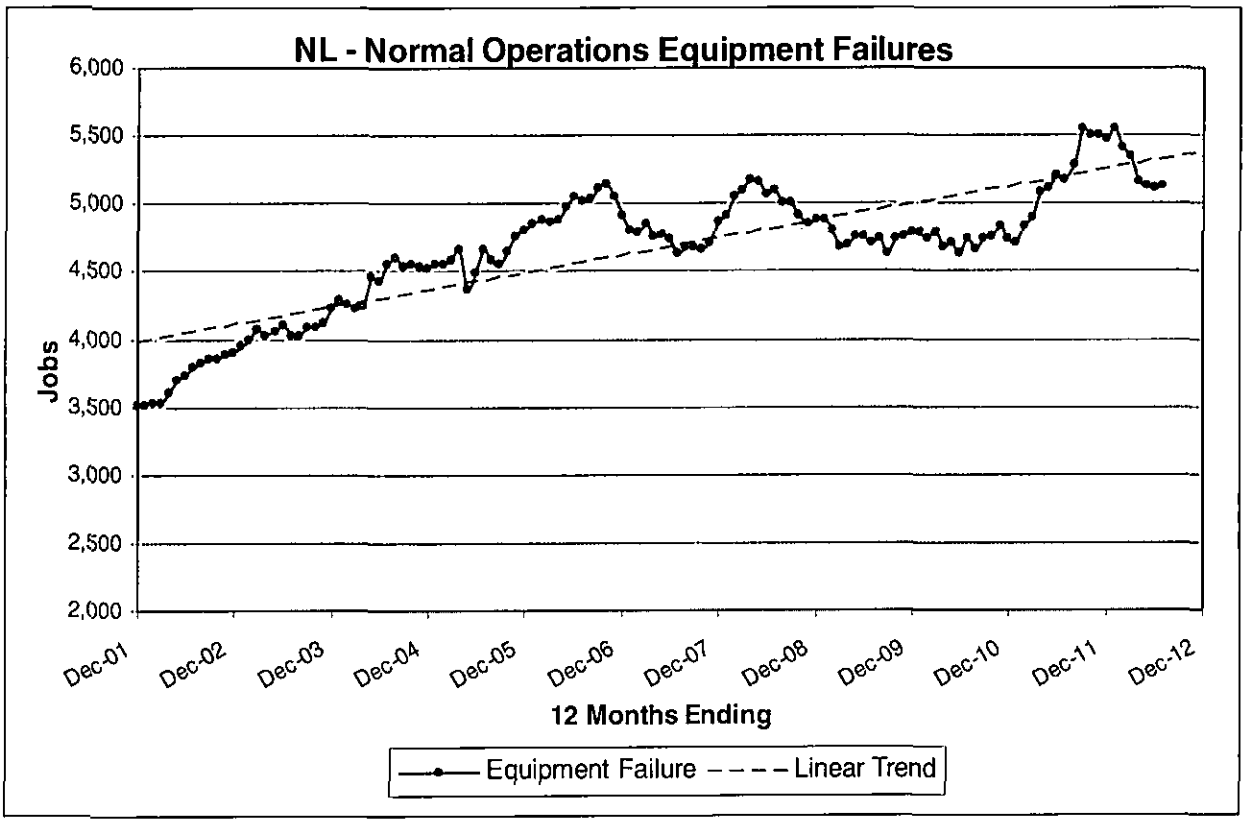

Figure 3: Equipment Failure Service Interruption Cases

The annual number of no-light cases due to equipment failure rose through 2006, stabilized for a time, resumed its upward trend in 2010 and now is stabilizing.

Programs contributing to stabilization are equipment replacements identified through Expanded Operational Reviews of 20% of circuits annually, aggressive worst performing circuit remediation, implementation of PPL Electric's Asset Optimization Strategy and the reintroduction of infrared inspections.

Although these programs have successfully slowed growth rates in the short-term, PPL Electric faces a long-term issue regarding aging infrastructure. Scheduled replacement of that infrastructure is necessary to avoid accelerating failure rates due to wear out.

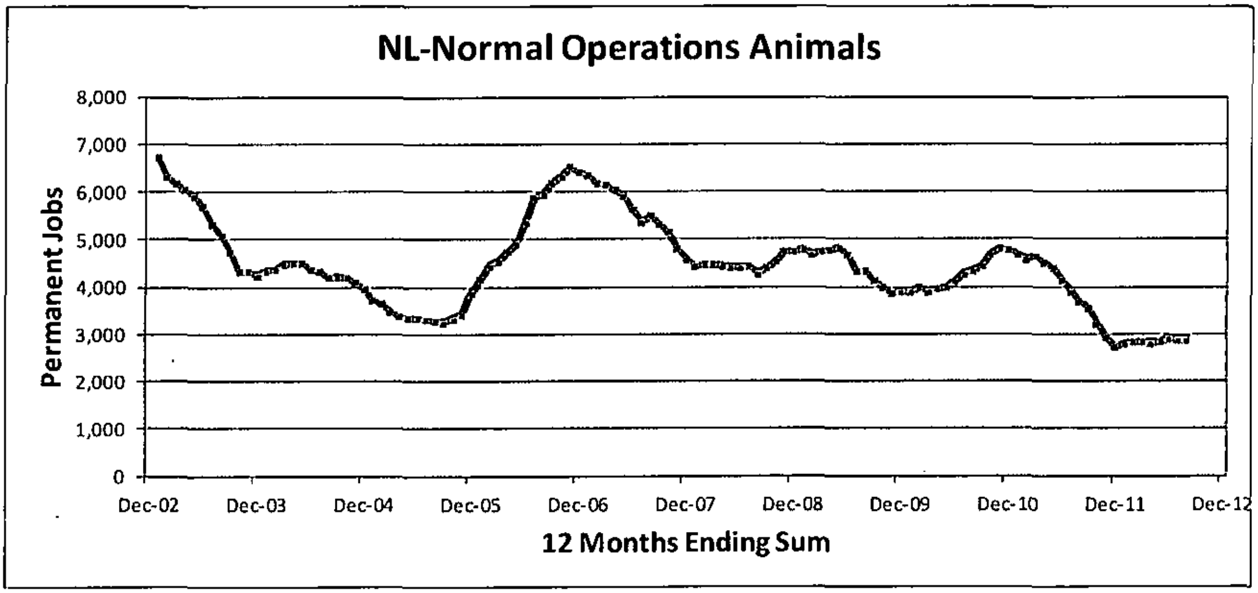

Figure 4: Animal Related Service Interruption Cases

Although animal-related service outages are caused by a wide variety of species (rodents, birds, reptiles, etc.), the majority are caused by squirrels. Because the squirrel population is cyclical due to cycles in food availability and disease epidemics, the magnitude of related service outages also is cyclical (see Figure4). However, PPL Electric does not have sufficient understanding of the population issues to predict either the amplitude or the period of the cycles. Service outages tend to be more frequent where vegetation near electrical facilities is denser. The success of mitigation efforts (Distribution and substation animal guarding, page 8) is more evident in peak-to-peak or valley-to-valley comparisons, rather than gross trend lines.

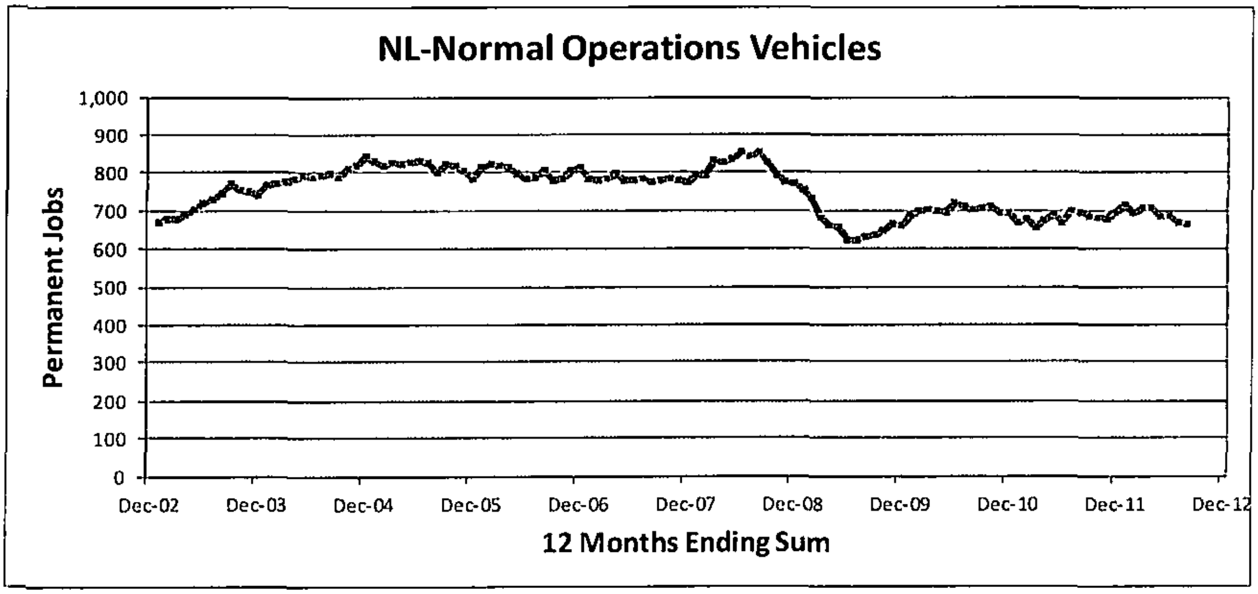

Figure 5: Vehicle Related Service Interruption Cases

The long-term trend (see Figure5) in vehicle-related cases indicates a steady trend, then a decline in 2008 followed by stabilization. PPL Electric identifies facilities with multiple hits and evaluates them for potential relocation.

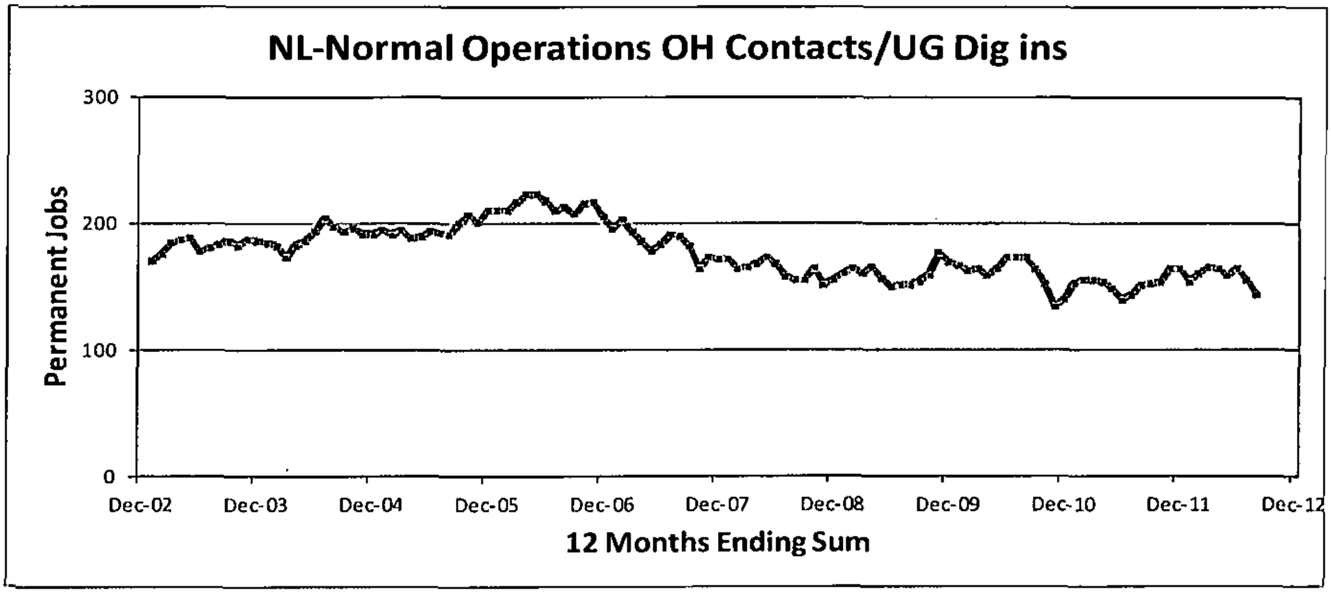

Figure 6: Overhead Contact/Underground Dig-in Service Interruption Cases

Overhead contacts and underground dig-ins generally are the result of construction activity around distribution facilities. The incidence of these events has declined (see Figure 6) due to the slowing of the local economy and the introduction of the Call 811 program

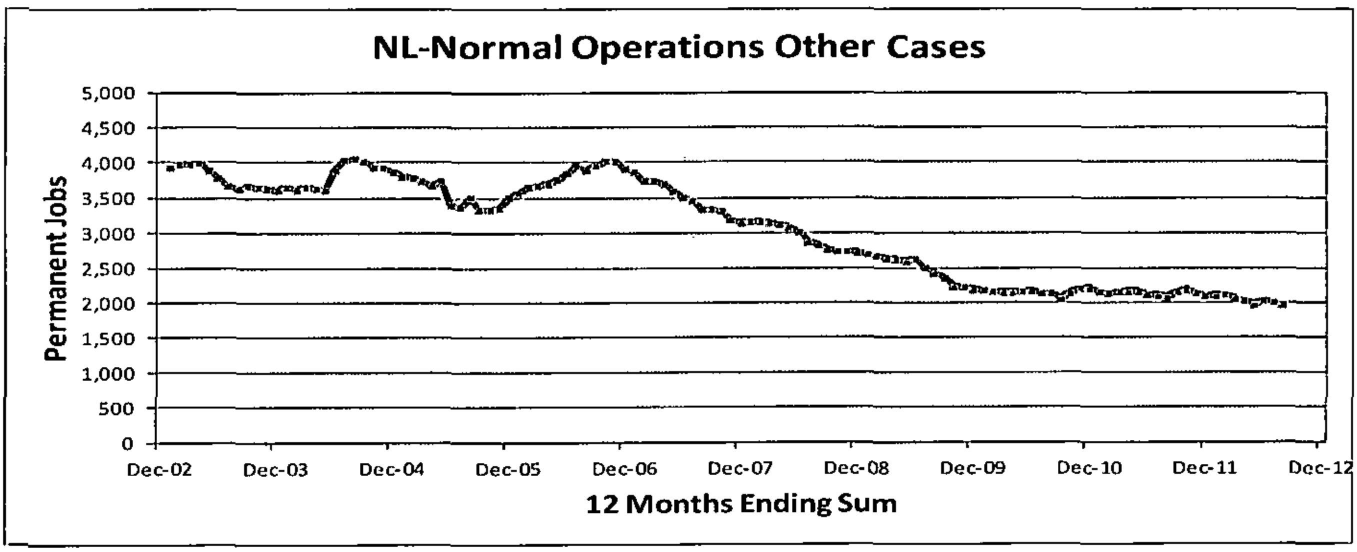

Figure 7: All Other Causes Service Interruption Cases

Service interruptions due to all other causes have declined (see Figure 7) since 2001 partially due to more accurate reporting relating to attributing (approximately 700 cases annually) cases to the correct causes.

Reliability is a large contributor to overall customer satisfaction and satisfaction levels vary depending upon the cause of the service outage. Customers are more understanding of storm and weather-related service outage impacts than they are of utility equipment failures. Ultimately though, outage duration trumps the cause of the service outage from a satisfaction point of view. It is prudent that analyses be conducted to determine the most cost-effective programs to reduce durations.

If it is more cost-effective to offset an increase in equipment failure cases with a program to reduce vegetation-related cases, the ratepayer is better served by this cost-effective choice. Similarly, if a program that reduces the average number of customers affected by each service outage is more cost-effective than a program to reduce the gross number of service outages, the more cost-effective program should be chosen. The management challenge is to maintain reliability within acceptable parameters in the most cost-effective manner.

52. Pa. Code § 57.198 (b) Plan Consistency

PPL Electric's plan is consistent with the National Electric Safety Code, Codes and Practices of the Institute of Electrical and Electronic Engineers, Federal Energy Regulatory Commission Regulations and the provisions of the American National Standards Institute, Inc.

52. Pa. Code § 57.198 (c) Time Frame Deviations

PPL Electric is requesting acceptance of the following deviations from the intervals in the Commission standard:

- Section 198 (n)(2). Pole Inspections. (vi) A load calculation. See the justification set forth on page 20.
- Section 198 (n)(4). Distribution overhead line inspections. See the justification set forth on page 24.
- Section 57.198 (n)(6). Distribution transformer inspections. See the justification set forth on page 33.

52. Pa. Code § 57.198 (m) Recordkeeping

Inspection and maintenance activities performed by PPL Electric employees are tracked by electronic work requests in the Company's Work & Asset Management System (WAM) software application which date-stamps transactions and captures an electronic signature of the employee certifying completion.

Inspection and maintenance activities performed by PPL Electric contractors are documented with itemized records, which identify when and what type of work was performed, before invoices for the work are paid.

52. Pa. Code § 57.198 (n)(1). Vegetation Management. *The Statewide minimum inspection and treatment cycle for vegetation management is between 4-8 years for distribution facilities. An EDC shall submit a condition-based plan for vegetation management for its distribution system facilities explaining its treatment cycle.*

Program Description

- Cycle

  Five-year tree trimming cycle for all distribution lines in the northern areas of PPL Electric's service territory.

  Four-year cycle tree trimming cycle for all distribution lines in the southern areas of PPL Electric's service territory.

  The demarcation line for the northern and southern areas is the Blue Mountains which does not follow the borders of PPL Electric's regions.

- Purpose

  Taller species of trees that are permitted to grow under power lines eventually will contact the wires, causing service interruptions and unsafe conditions. It is necessary for PPL Electric to trim these trees to continue safe and reliable electric service

  To safeguard the reliability of its electric distribution system, PPL Electric has developed a comprehensive program to manage vegetation around power lines. Keeping trees and other vegetation away from high-voltage lines is very important. If trees touch these lines, there can be short-circuits and widespread service outages.

- Process

  PPL Electric uses a widely accepted tree maintenance practice known as directional pruning, which removes only the branches growing toward power lines. Remaining branches are left to grow naturally. Trees retain more of their natural shape and spacing, and because less of the live crown is removed, trees are not placed under as much stress. The National Arbor Day Foundation and other tree care groups endorse directional pruning as better for tree health. This method also follows the nationally recognized Standards for Tree Care Operations (ANSI A300).

- Justification

  Historically, PPL Electric has discriminated between urban and rural circuits, and set its trimming intervals accordingly, most recently six-year intervals for rural circuits and four-year intervals for urban circuits, based upon data showing that 59% of customers interrupted by trimming-related causes were served by urban circuits.

However, tree trimming is intended to manage vegetation growth and growth rates vary geographically, not by urban/rural designations. Vegetation growth rates are higher south of the Blue Mountains than north of them. Accordingly, a 2009 study recommended realigning intervals on a geographic basis. This study showed that southern circuits were responsible for 64% of customers interrupted by trimming-related causes.

The 2009 study estimated the reliability benefit expressed in Customer Minutes Interrupted ("CMI") for changing to North/South trim cycles from Rural/Urban trim cycles to be approximately 2.4 million CMI at an additional cost of $1.5 million annually, or $0.63 per CMI.

PPL Electric employs a $2.00 per CMI saved cost threshold[1] as a principal criteria for evaluating new projects for inclusion in the portfolio of reliability programs. Costs below that threshold are considered to be prudent investments, while those above typically provide less benefit for the cost. The cost threshold assists in applying finite resources to programs producing better results, thus enabling the most effective portfolio of programs. As a result, the change to North/South trim cycles was made because the estimated cost is well below the threshold.

- Reference documentation and location

  For further detailed information, see the Distribution Vegetation Management contract and Specification URS-3001 on file in the office of the Director-EU Project/Contract Management.

- Record keeping

  Tree trimming is performed by contractors and is documented with itemized records, which identify when and what type of work was performed, before invoices for the work are paid.

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[1] Cost threshold recommended by Richard E. Brown, Sr. Vice President and co-founder of Quanta Technology, a firm specializing in technical and management consulting for utilities. Dr. Brown has provided consulting services to most major utilities in the U.S. Dr. Brown has published more than 90 technical papers related to asset management and is the author of Electric Power Distribution Reliability, CRC Press, 2009.

As reported by Doug Staszesky, Director –Product Management, S&C Electric Company, in his presentation "*Distribution Automation – An Overview,*" common thresholds vary from $1.5 to 3.0 million per SAIDI minute saved, which translates to $1.08 to $2.17 per CMI for PPL Electric.

Inspection Plan

Distribution Vegetation Management			
	Area *(Line Miles)*	**Scheduled Trimming** *(Line Miles)*	
		2014	**2015**
PPL Electric Utilities Corporation *Total Line Miles (28,052)*	Lehigh (3,460)	860	860
	Northeast (5,178)	1,024	1,024
	Central (4,526)	956	956
	Susquehanna (5,765)	1,132	1,132
	Harrisburg (4,806)	1,186	1,186
	Lancaster (4,317)	1,079	1,079
	Totals	**6,236**	**6,236**

52. Pa. Code § 57.198 (n)(2). Pole Inspections. *Distribution poles shall be inspected at least as often as every 10-12 years except for the new southern yellow pine creosoted utility poles which shall be* *initially inspected within 25 years, then within 12 years annually after the initial inspection. Pole inspections must include:*

(i) Drill tests at and below ground level.
(ii) A shell test.
(iii) Visual inspection for holes or evidence of insect infestation.
(iv) Visual inspection for evidence of unauthorized backfilling or excavation near the pole.
(v) Visual inspection for signs of lightning strikes.
(vi) A load calculation.

Program Description

- Cycle

  Every ten years.

- Purpose

  Distribution poles are inspected to identify and measure the extent of decay and defects that may adversely affect safety or service reliability.

- Process

  Each pole is partially excavated (two holes on opposite sides of the pole). The pole is inspected visually, sounded and bored above ground in addition to the partial excavation. If decay is present, a full excavation 360 degrees around the pole is done. All measurable decay is entered into the contractor's engineering-based software program to determine the percentage of remaining strength, taking into consideration ANSI and NESC standards. If the percentage of remaining strength is below established parameters, a load calculation is performed to determine the pole's capacity to support the load in accordance with NESC standards.

  Based upon the inspection and testing results, the pole is either treated with a preservative, reinforced (trussed) or replaced.

- Justification

  PPL Electric's pole inspection program generally complies with the intervals set forth in 52. Pa. Code §57.198 (n)(2), NESC rules and is consistent with known industry practices.

  PPL Electric hereby proposes a deviation from the requirement for a load calculation to be performed for each pole inspected. The design of PPL Electric's lines is based on its Distribution Engineering Instructions which are based upon NESC Heavy Loading conditions. These instructions provide adequate safety factors such that the allowable percentage of strength reduction does not compromise the ability of the pole to support the load. PPL Electric requires entities attaching facilities to its poles to perform their own load calculations before making the attachment. Load calculations are performed on poles when the estimated percentage of remaining strength falls below established parameters.

PPL Electric does not track service outages caused by pole equipment failure as a discrete category. Poles are contained within a category that includes poles arms, brackets, guys, push braces, pole top extensions and any other mounting hardware. In 2009, equipment failures requiring replacement in this category amounted to 266 (1.5% of total cases), of which only a small fraction are poles. Excluding pole fires, text comments in only 55 cases (0.3% of total cases) suggest broken PPL Electric-owned poles. Fifty-five poles represent less than 1/100 of one percent of PPL Electric's 875,000 pole inventory. Most of the limited numbers of pole failures are aggravated by weather conditions such as trees being blown into lines, so the potential risk reduction through a load calculation is insignificant.

Beginning in 2010, the Company's wood pole maintenance program was enhanced from an inspection-only process to an inspection and treat program, whereby all poles passing the inspection are chemically treated to arrest decay at the same visit. The preservative treatment permits the next inspection to be at a uniform ten years, rather than the former one to nine-year cycle after original inspection applied to individual poles. Changing to a uniform ten-year cycle will enable more economic geographic-based inspections where all poles in a defined area are inspected, rather than the current method of inspecting scattered poles with individually specified intervals which maximizes the employee travel involved. Reference documentation and location

For further detailed information, see the *In-Service Wood Pole Inspection and Condition-Based Treatment Specifications* (Exhibit A, Contract #486558-C on file in the office of the Director-EU Project/Contract Management) and the following instructions on PPL Electric's Distribution Department Instruction website:

DDI L-386, *Inspecting Wood Poles*

- Record keeping

Pole inspections are performed by contractors and are documented with itemized records, which identify when and what type of work was performed, before invoices for the work are paid.

Inspection Plan

In order to convert from the former variable inspection interval (where the annual scope varied from 5 to 15% of inventory) to a uniform interval, a higher number of poles than the steady-state value of approximately 10% of inventory are required in the early years. For the first cycle, geographic areas have to be defined in order to group together a sizeable portion of poles with similar inspection due dates. Because this will not be completed until just before the beginning of each year of the first cycle, the regional breakdown of the annual scope will be unknown at the time of this plan's submission. The regional breakdown will be provided in the Annual Reliability Reports for the preceding years.

Distribution Wood Pole Inspections			
	Area *(Poles)*	**Inspections Planned** *(Poles)*	
		2014	**2015**
PPL Electric Utilities Corporation *Total Poles (878,238)*	Lehigh (117,272)	TBD	TBD
	Northeast (174,249	TBD	TBD
	Central (157,080)	TBD	TBD
	Susquehanna (159,579	TBD	TBD
	Harrisburg (139,218)	TBD	TBD
	Lancaster (130,840)	TBD	TBD
	Totals	**90,000**	**90,000**

52. Pa. Code § 57.198 (n)(3). Pole inspection failure. *If a pole fails the groundline inspection and shows dangerous conditions that are an immediate risk to public or employee safety or conditions affecting the integrity of the circuit, the pole shall be replaced within 30 days of the date of inspection.*

Corrective Maintenance

- Pole replacement data is provided to PPL Electric weekly. Critical poles, those that carry ≤5% remaining strength or those that pose an immediate safety concern, are reinforced or replaced as soon as possible, but no later than 30 days after notification. Other non-restorable rejected poles generally are replaced within one year of identification. Pole strength and loading calculations are provided for each rejected pole to assist in reinforce vs. replace decisions and schedule prioritization.

- Reinforcement by steel C-Truss, a galvanized steel truss which is banded around the pole in order to regain the pole's original strength or fiber wrap, several layers of high-strength fiberglass wrapped onto the pole and saturated with resin is completed within 90 days of identification. The method of reinforcement is determined by the circumstances and/or location of the pole.

52. Pa. Code § 57.198 (n)(4). Distribution overhead line inspections. *Distribution lines shall be inspected by ground patrol a minimum of once every 1-2 years. A visual inspection must include checking for:*

(i) Broken insulators.
(ii) Conditions that may adversely affect operation of the overhead transformer.
(iii) Other conditions that may adversely affect operation of the overhead distribution line.

Program Description

- Cycle

  Infrared inspection: 3-phase and 2-phase overhead lines adjacent to roadways every two years.

  Visual inspection: Condition based – selected line segments. Inspections are scheduled when indicated by circuit performance, as measured by PPL Electric's Circuit Performance Index (CPI) and confirmed by an analysis of actual service interruptions that identifies failures addressable by visual inspection.

  Pole inspection (see page 20): Every ten years.

- Purpose

  The objective of an overhead line inspection is to identify and correct hardware or equipment defects that may lead to a future service interruption or pose a safety hazard. Defects are identified by inspection, ranked in order of priority and scheduled for repair.

- Process

  Infrared: Multi-phase distribution lines adjacent to roadways are scanned from vehicles. A roof-mounted infrared camera is employed to capture a thermal image of components carrying electrical current. Heat emission measurements are compared to reference temperatures. Probability of failure is estimated based upon the magnitude of temperature difference from reference. The method detects problems in current carrying components such as transformers, connections, splices, hot line clamps, disconnects, switches, lightning arresters, Bridges disconnects, terminators, etc., whether or not there are visible defects. A detailed report of findings is prepared. At-risk items are prioritized and mitigated by repair or replacement.

  Visual: An analysis of actual service interruptions is conducted on selected circuits (e.g., poor performing circuits as measured by PPL Electric's Circuit Performance Index ("CPI"), circuits with excessive customers experiencing multiple service interruptions ("CEMI"), and circuits undergoing Expanded Operational Reviews ("EOR")). If that analysis indicates that a pattern of equipment failure exists, a visual line inspection is scheduled. In addition to looking for visible defects in current-carrying components, visual inspection looks for mechanical defects in anchors, guys, crossarms, insulators, offset brackets, grounding systems and poles.

Pole Inspection: As an integral part of the ten-year pole inspection process, the inspector observes, notes and reports at-risk conditions of all pole attachments, specifically crossarms, braces, conductors, transformers, fuse cutouts, lightning arresters, reclosers, regulators, capacitors, switches, wildlife protection, vegetation encroachment, guys, anchors, ground wires and rods.

- Justification

PPL Electric hereby proposes a deviation from the 1-2 year inspection cycle on the basis of an effectiveness evaluation and cost benefit analysis in favor of the program described herein. Resources that would be applied to shorter visual cycles than this proposal would reduce the resources applied to other more cost-effective reliability programs described in this plan.

PPL Electric conducted a trial of infrared inspections of multi-phase lines in 2006. The trial inspections cost $122,500 and identified repairs costing $100,000, saving an estimated 1,460,000-2,600,000 CMI, at a cost of $0.15 to $0.09 per CMI saved.

PPL Electric employs a $2.00 per CMI saved cost threshold (see footnote 1, page 18) as a principal criteria for evaluating new projects for inclusion in the portfolio of reliability programs. Costs below that threshold are generally considered to be prudent investments, while those above typically provide less benefit for the cost. The cost threshold assists in applying finite resources to programs producing better results, thus enabling the most effective portfolio of programs. Because infrared costs per CMI saved are well below the threshold, PPL Electric instituted a two-year infrared cycle for accessible multi-phase lines.

PPL Electric conducted an overhead line visual inspection cost benefit study in 2010, a copy of which is on file in the office of the Manager-System Reliability & Distribution Asset Management and is available for review upon request. This study calculated a reliability benefit as a probability that inspections and the associated repairs will reduce equipment failure service interruptions. The overall probability is the product of (a) the probability that an equipment failure service outage is preceded by a visible condition, (b) the probability that the visible condition exists at the time of inspection, (c) the probability that an inspector actually detects a condition that exists and (d) the probability that the condition is repaired before a service interruption occurs. For seven of the thirteen overhead distribution component codes, actual inspection data established little likelihood of visible conditions preceding failure. For the remaining six component codes, subject matter experts were surveyed. The resulting probability estimates were applied to actual service outage data to estimate avoided CMI per mile. The inspection and repair cost per mile divided by CMI avoided per mile yielded an estimate of cost per CMI avoided. Figure 8 shows these costs per CMI for various inspection intervals.

The study also estimated avoided CMI/mile for visual inspections that follow infrared inspections because there is significant overlap between the two methods: infrared identifies both visible and hidden defects in current carrying components, while visual inspection detects only visible defects in electrical and mechanical components. Figure 8 shows these costs per CMI for various inspection intervals.

As *Figure 8 shows, given PPL Electric's reliability parameters, there is no interval for* visual overhead inspections that meets the established cost threshold, particularly when performed in conjunction with infrared inspections. Visual inspections alone at two-year intervals are 50% above the threshold; two year visuals done in conjunction with infrared are 100% above the threshold.

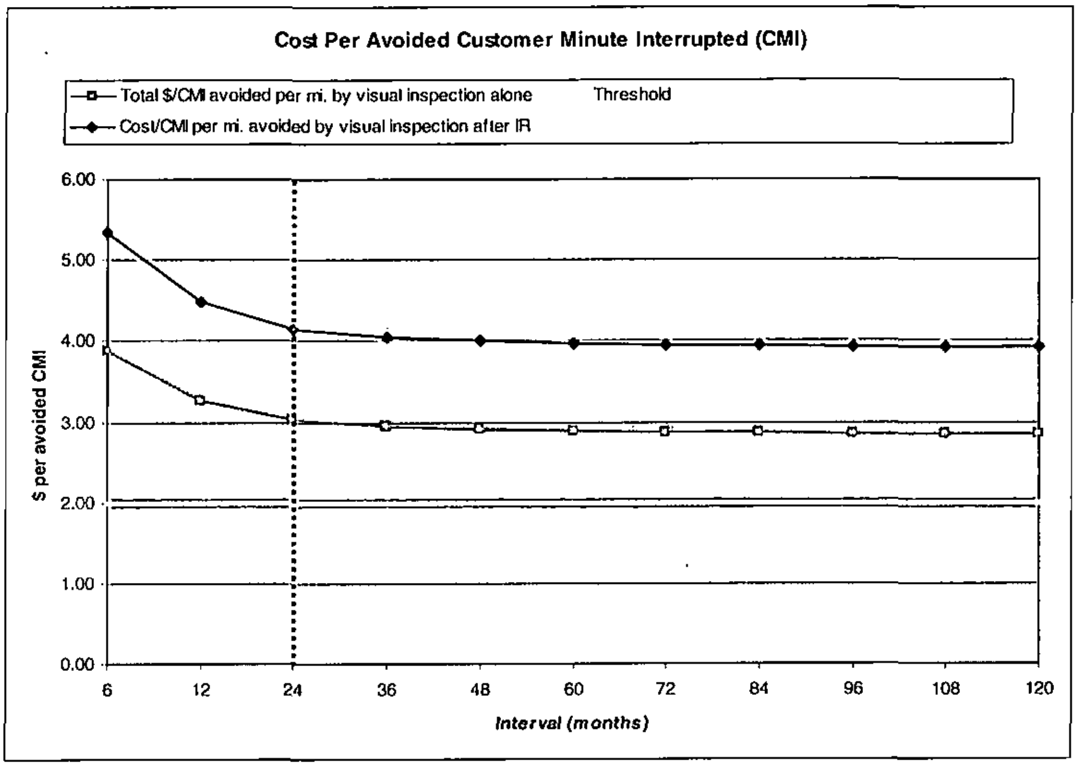

Figure 8: Overhead Line Inspection Cost per Avoided CMI

Although universal overhead visual inspections are not cost-effective, targeted visual inspections have more value. Figure 9 shows that in a typical year, less than 15% of the circuits are responsible for 80% of equipment failure CMI. For the period 2002 to 2009, 30% of the circuits were responsible for 80% of equipment failure CMI.

Consequently, PPL Electric employs the condition-based visual inspection approach described above, combined with Expanded Operational Review (see page 7) field checks and overhead inspections in conjunction with pole inspections. The efficacy of this approach is confirmed by the flattening of the growth curve of equipment failures discussed on page 13.

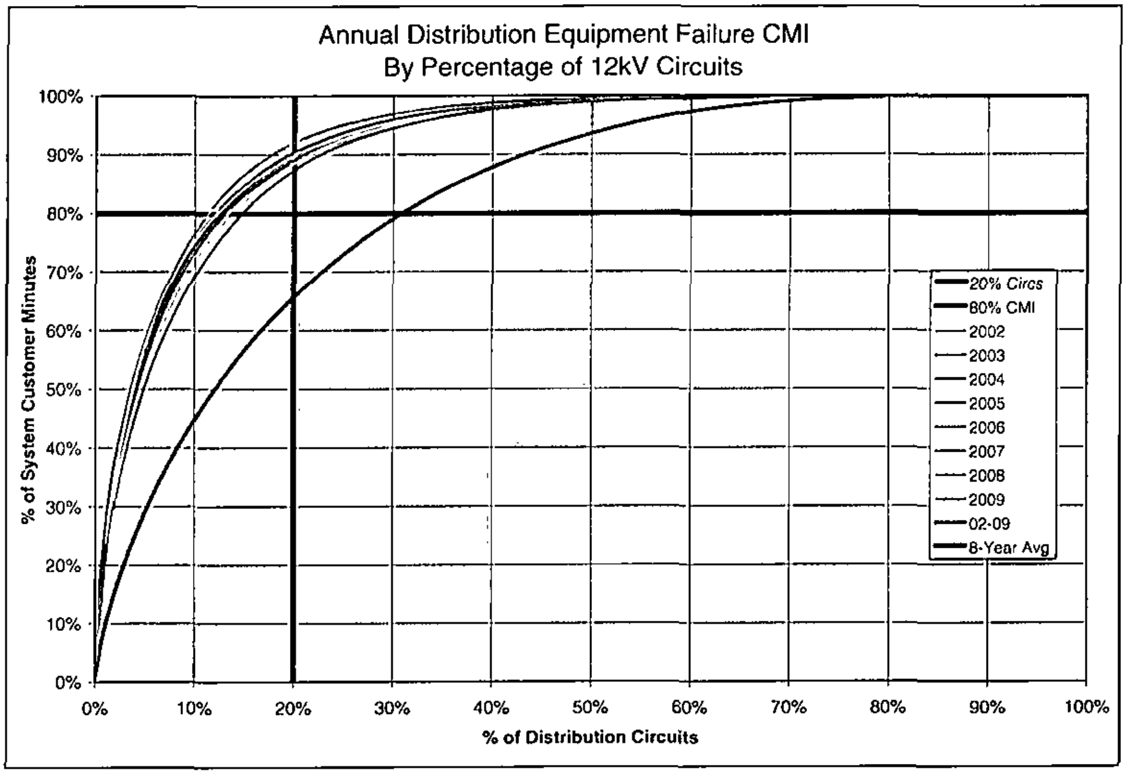

Figure 9: Cumulative Circuit Contribution to Equipment Failure CMI (excluding Major Events only)

- Reference documentation and location

For further detailed information, see the following instructions on PPL Electric's Distribution Department Instruction website:

DDI L-369, *Infrared Inspection Program*

DDI L-380, *Line Inspection & Reliability Improvement Program – Overhead*

- Record keeping

  Infrared: Inspections are performed by contractors. Contractor supplied documentation supporting invoices identifies work performed and completion dates.

  Visual: Currently inspections are tracked by electronic spreadsheets maintained in regional offices.

  Pole Inspection: See page 20.

Inspection Plan

Distribution Overhead Multi-phase Line Infrared Inspections			
	Area *(Total/Drivable Line Miles)*	**Infrared Inspections Planned** *(Line Miles)*	
		2014	**2015**
PPL Electric Utilities Corporation *Total/Drivable Line Miles[2] 8,556/8,128)*	Lehigh (1,320/1,254	610	610
	Northeast (1,435/1,363)	691	691
	Central (1,606/1,525)	772	772
	Susquehanna 1,246/1,184)	609	609
	Harrisburg (1,406/1,336)	650	650
	Lancaster (1,543/1,466)	732	732
	Totals	**4,064**	**4,064**

[2] For planning purposes, an assumption that 95% of multi-phase line miles are drivable is employed.

Distribution Overhead Visual Inspections			
	Area *(Line Miles)*	**Estimated Visual Inspections** *(Line Miles)*	
		2014	**2015**
PPL Electric Utilities Corporation *Line Miles (28,106)*	Lehigh (3,463)	390	390
	Northeast (5,191)	540	540
	Central (4,539)	480	480
	Susquehanna (5,776)	600	600
	Harrisburg (4,820)	510	510
	Lancaster (4,317)	480	480
	Totals	**3,000**	**3,000**

Pole Inspection: See page 20.

52. Pa. Code § 57.198 (n)(5). Inspection failure. *If critical maintenance problems are found that affect the integrity of the circuits, they shall be repaired or replaced no later than 30 days from discovery.*

Corrective Maintenance Description

- Infrared

  Priorities for corrective maintenance are determined by the magnitude of the variance from normal operating temperature.

Distribution Overhead Infrared Inspections Corrective Maintenance		
	Variance from Normal Operating Temp.	**Days Allowed After Report Receipt for Service**
Secondaries	+20-60° C	8 weeks
	> +60° C	2 weeks
Disconnect Switches	+20-60° C	8 weeks
	> +60° C	2 weeks
All Other Facilities	+10-40° C	8 weeks
	> +40° C	2 weeks

- Visual

The inspector determines the urgency for repairs and assigns an appropriate order of priority from three categories (Emergency, Priority and Unsatisfactory) described below.

Distribution Overhead Visual Inspections Corrective Maintenance			
Definition	**I&M Standard**	**Work Type**	**Description**
Emergency; Defects which: (1) Threaten the safety of the public or employees; or (2) Will cause a service interruption at any moment.	Corrective Action taken Immediately	Conductor	Dislodged Energized Wire
		Conductor	Phase Wire on Crossarm
		Xfmr/Device	Oil Leaking from Equipment
		Pole	Cracked/Deteriorated - Severe (i.e. Vehicle Hit & Run)
		Crossarm	Cracked/Deteriorated - Severe (Arm is broken and hanging, etc)
		Conductor	Missing APD's w/ > 90% Conductor Strand Damage
Priority; Defects with a high probability of causing a service interruption if not corrected promptly.	Corrective action must be taken within 30 days.	Insulator	Cracked or Broken
		Cutout	Cracked or Broken
		Crossarm	Cracked/Deteriorated - Heavy
		Conductor	Missing APD's w/ > 50% Conductor Strand Damage
Unsatisfactory; Defects with a lower probability of causing a service interruption if not corrected promptly.	Corrective action must be taken within 3 months.	Hardware	Failed LA
		Guy	Guy wire broken/missing, Rod Slipped or Lead Loose
		Insulator	Tracking
		Conductor	Broken Strands
		Conductor	Missing APD's w/ > 20% Conductor Strand Damage
		Conductor	Broken Tie Wire
		Pole	Cracked/Deteriorated - Heavy
		Crossarm	Cracked/Deteriorated - Moderate (Split Total Length)
		Cutout	Arc Shield Deteriorated
		Hardware	Missing Cotter Pins

- Reference documentation and location

  For further detailed information, see the following instructions on PPL Electric's Distribution Department Instruction website:

  DDI L-369, *Infrared Inspection Program*

  DDI L-380, *Line Inspection & Reliability Improvement Program – Overhead*

52. Pa. Code § 57.198 (n)(6). Distribution transformer inspections. *Overhead distribution transformers shall be visually inspected as part of the distribution line inspection every 1-2 years. Above-ground pad-mounted transformers shall be inspected at least as often as every 5 years and below-ground transformers shall be inspected at least as often as every 8 years. An inspection must include checking for:*

(i) Rust, dents or other evidence of contact.
(ii) Leaking oil.
(iii) Installation of fences or shrubbery that could adversely affect access to and operation of the transformer.
(iv) Unauthorized excavation or changes in grade near the transformer.

Program Description

- Cycle

  Overhead: Condition based – selected line segments. Overhead transformers are inspected as part of overhead visual line inspections (see page 24), infrared inspections, and pole inspections (see page 20).

  Pad-mount and below-ground: Condition based – selected line segments. Inspections are scheduled when indicated by circuit performance, as measured by PPL Electric's Circuit Performance Index (CPI) and confirmed by an analysis of actual service interruptions that identifies underground failures addressable by visual inspection.

  Pad-mount and below-ground transformers also are inspected as part of the underground residential development (URD) cable testing, replacement and curing program, which tests approximately 500 sections per year and cures approximately 600 sections per year.

  During 2012, PPL Electric is performing a pilot of pad-mounted transformer inspections which will help determine the overall condition of these assets, as well as the cost-effectiveness of a more formalized inspection program.

- Purpose

  The objective of a transformer inspection is to identify and correct hardware or equipment defects that may lead to a future service interruption or pose a safety hazard. Defects are identified by inspection, ranked in order of priority and scheduled for repair.

- Process

  Overhead and underground transformers are visually inspected for damage (rust, dents, cracks, locking devices, broken bushings, etc.), integrity of connections and leaks. In addition, pad-mounts and below-ground transformers have cables and elbows inspected for deterioration, foundations and covers inspected and animals, nests, cobwebs and vegetation removed.

- Justification

  PPL Electric hereby proposes a deviation from the fixed inspection cycle for transformers in favor of the condition-based inspection program described herein.

  The overhead line inspection cost benefit study described on page 25 estimated that about 20,000 CMI annually could be saved via visual overhead transformer inspections. The estimated cost to inspect those transformers every two years would be $1.3 million or $65 per CMI avoided, well above the threshold employed by PPL Electric of $2.00 per CMI saved (see footnote 1, page 18) for identifying prudent reliability investments. Costs below that threshold are considered to be prudent investments, while those above typically provide less benefit for the cost. The cost threshold assists in applying finite resources to programs producing better results, thus enabling the most effective portfolio of programs.

  Similarly, pad-mount transformer inspections are estimated to save no more than 2,692 CMI at a cost of $333,000 annually for a five-year cycle, or $124 per CMI saved. Below-ground transformer inspections are estimated to save no more than 271 CMI at a cost of $25,000 annually for an eight-year cycle, or $92 per CMI saved. Both of these values also are well above the $2.00 per CMI saved reliability benefit threshold.

  Resources that would be applied to shorter cycles than this proposal would reduce the resources applied to other more cost-effective reliability programs described in this plan.

- Reference documentation and location

  For further detailed information, see the following instructions on PPL Electric's Distribution Department Instruction website:

  DDI L-380, *Line Inspection & Reliability Improvement Program – Overhead*

  DDI L-381, *Line Inspection & Reliability Improvement Program – Underground*

- Record keeping

  Currently inspections are tracked by electronic spreadsheets maintained in regional offices.

52. Pa. Code § 57.198 (n)(7). Recloser inspections. *Three-phase reclosers shall be inspected on a cycle of 8 years or less. Single-phase reclosers shall be inspected as part of the EDC's individual distribution line inspection plan.*

Program Description

- Cycle

- PPL Electric has initiated an upgrade program to replace selected OCRs with vacuum circuit reclosers ("VCR") based upon a review of the dominant failure modes and causes. The newer technology replaces oil with a vacuum as the interrupting media. This eliminates the OCR maintenance issues of carbonized oil, contact deterioration and the timing issues that sometimes occur with OCRs. As PPL Electric gains experience with the new technology and does further study with all remaining reclosers, an appropriate replacement interval will be established for all types of reclosers. Three-phase VCRs are subjected to infrared inspection on the same 2-year cycle as OCRs.

  Three-phase oil circuit reclosers ("OCR"): 2-year infrared (see page 24); 8-year replacement. In addition, any device with an electronic control is visually inspected every 2 years.

  Single-phase OCRs: inspected as part of PPL Electric's distribution line inspection program (see page 24); 8-year replacement.

- Purpose

  The purpose of the recloser inspection and maintenance program is to assure the reliable operation of reclosers that are in service, and to test and refurbish units in the most cost-effective manner.

- Process

  Three-phase oil and vacuum reclosers are included in the two-year infrared line inspection program (see page 24).

  Three-phase and single-phase OCRs are replaced with new or refurbished units based upon installation date.

- Justification

  A recloser's function is to isolate faults while minimizing the number of customers affected by permanent service outages. Visual inspection of an OCR provides relatively little useful information about the unit's capability to perform its function compared to testing. Testing in place would require almost all of the same steps that are involved in replacement. Bench testing is preferable to testing in place and refurbishment requires the unit's removal from service.

As replacement cycles are extended, planned replacement costs decline, while failures with their forced replacement costs and SAIFI increase. A 2003 PPL Electric cost/benefit analysis showed that total costs decline until a twelve-year replacement cycle is reached, with total costs increasing for replacement cycles longer than twelve years (See Figure 10). Given PPL Electric's current reliability performance, an eight-year cycle provides an appropriate balance of cost and SAIFI. This eight-year cycle was confirmed in the 2008-09 AOS study (see page 7).

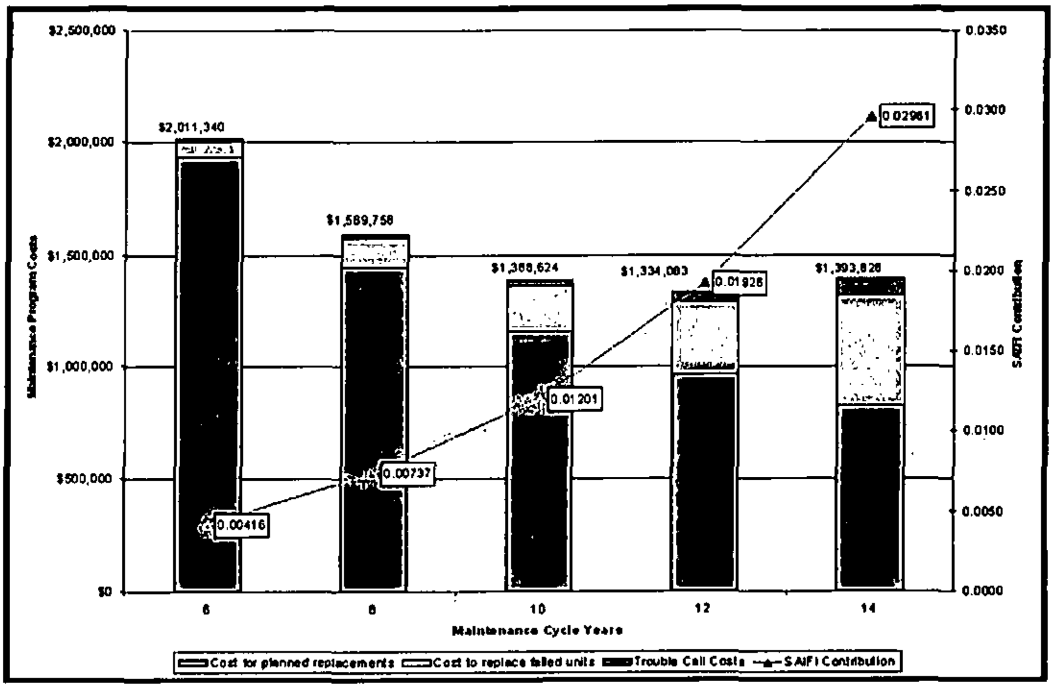

Figure 10: Total Cost vs. SAIFI Contribution 2003

- Record keeping

Infrared: Inspections are performed by contractors. Contractor supplied documentation supporting invoices identifies work performed and completion dates.

Recloser replacements performed by PPL Electric employees are tracked by electronic work requests in its Work & Asset Management System ("WAM") software application which date-stamps transactions and captures an electronic signature of the employee certifying completion.

Replacement Plan

Actual scope is determined annually based upon the number of OCRs on the system, phase and type of OCR and recommendations from the Standards group for replacement. The projections below are tentative until replacement recommendations are provided.

Distribution OCR Replacements			
	Area *(Number of OCRs)*	Replacements Planned	
		2014	**2015**
PPL Electric Utilities Corporation *Total OCRs (4,874)*	Lehigh (789)	120	120
	Northeast (905)	142	142
	Central (776)	120	120
	Susquehanna (918)	143	143
	Harrisburg (747)	113	113
	Lancaster (739)	112	112
	Totals	**750**	**750**

52. Pa. Code § 57.198 (n)(8). Substation inspections. *Substation equipment, structures and hardware shall be inspected on a cycle of 5 weeks or less.*

Program Description

- Cycle

	Visual	Infrared
Distribution-SCADA Controlled	Monthly	Annual
Distribution-Non SCADA	Monthly	Annual

- Purpose

  Periodic substation inspections verify the integrity of station physical security, record and correct any security breaches, verify the proper fluid levels and gas pressures, and identify any leaks, verify the proper operation of essential station equipment and initiate any necessary corrective actions.

- Process

  Inspection and recording of abnormal conditions, including, but not limited to, the following types of substation equipment:

  - Power transformers
  - Circuit breakers
  - Auxiliary equipment
  - Batteries and chargers
  - Control house
  - Yard and perimeter

- Justification

  The current intervals are supported by a cost benefit analysis last updated in 2007.

  PPL Electric's plan is consistent with 52. Pa. Code § 57.198 (n)(8). Substation inspections.

- Reference documentation and location

  For further detailed information, see the following instructions in PPL Electric's Distribution Department Instruction Manual:

DDI S-101, *Unattended Substation Inspection*

DDI S-102, *Substation Lead Acid Storage Batteries*

DDI S-110, *Power Transformers*

- Record keeping

Inspections are initiated within the Cascade Maintenance Management System ("MMS") and tracked to completion within the Company's Work & Asset Management System ("WAM").

<u>Inspection Plan</u>

Distribution Substation Visual Inspections			
	Area *(# of Substations)*	**Inspections Planned**	
		2014	**2015**
PPL Electric Utilities Corporation *Total Substations 351*	Lehigh (57)	684	684
	Northeast (57)	684	684
	Central (68	816	816
	Susquehanna (50)	600	600
	Harrisburg 59)	708	708
	Lancaster 60)	720	720
	Totals	**4,212**	**4,212**

[1] Distribution fixed substations in service as of September, 2012 from Electronic Facilities Database (EFD). Two additional substations are budgeted to be in service in 2013, three in 2014 and two in 2015.

Appendix A: Transmission Programs and Procedures

Program	Activity
Helicopter Inspections – Routine	Aerial linemen perform annual routine transmission line patrols from a helicopter. They identify damaged or deteriorated equipment. Engineers review the findings and develop plans for repair or replacement.
Helicopter Inspections – Comprehensive	Aerial linemen perform an overhead comprehensive inspection of transmission line facilities on a four-year cycle. Detailed condition reports with close-up digital photos are prepared for each specific component problem found along the transmission line and right-of-way. Engineers review the findings and schedule corrective maintenance as needed.
Helicopter Inspections – Emergency	Aerial linemen perform patrols of transmission lines that operate abnormally. This inspection focuses on identifying damage that may have been caused by lightning, inclement weather, equipment failure or vandalism. Because of the nature of this work, corrective actions generally are expedited.
Field Inspections – Emergency	Line personnel perform emergency foot patrols to inspect transmission lines that operated abnormally. This inspection focuses on identifying damage that may have been caused by lightning, inclement weather, equipment failure or vandalism. Due to the nature of this damage, corrective actions generally are expedited.
Wood Pole – Inspection, Treatment, Replacement, Trussing (reinforcement)	Inspectors examine wood poles for deterioration and measure the degree of decay. Based on the results, the pole is either scheduled for a future inspection, reinforcement for extended life or replacement.
Equipment Maintenance	During helicopter and foot patrols, equipment and facilities are identified that require repairs. Based on need and criticality, repairs are either scheduled or completed as soon as possible.
Line Switches – Maintenance and Inspection	Line personnel inspect, maintain and perform operational tests on 138kV and 69kV line air break switches to assure proper operation.

Program	Activity
Line Switch Upgrades	Line personnel install lightning arresters on 138kV and 69kV line switches to increase system reliability. Existing parallel break air breaks (PBAB) are being upgraded to load sectionalizing air breaks (LSAB) to improve switching capability as needed.
Circuit Analysis	Engineers analyze circuit loading and performance to identify areas needing increased line capacity or improved line reliability.

Appendix B: Substation Programs and Procedures

Program	Activity
Load Survey	Automatic monitoring devices such as SCADA provide continuous, real-time loading information. Engineers review equipment loading and identify facilities and transfer capabilities approaching capacity limits. A portion of the load may be supplied from a different source, the existing facilities may be upgraded, new lines and equipment may be added, or a new substation may be built to address capacity deficiencies.
Substation Inspection/Repair	Electricians inspect substations for security and equipment reliability on a time-based maintenance cycle. They identify and correct potential equipment problems before a failure or service interruption occurs.
Equipment Service	Electricians perform operational tests on power transformers, load tap changers ("LTC"), voltage regulators, circuit breakers, circuit switchers, vacuum switches, air break switches and transformer protective switches on a time-based maintenance cycle to assure that equipment is operating within established parameters. Equipment serviced includes batteries, battery chargers, protective relays, high voltage fuses and high-speed automatic grounding switches. Depending on the type of equipment, "service" can include actions other than operational testing.
Inspection and Condition Assessment	Electricians inspect and perform condition assessments of circuit breakers, wave traps, ground switches, stick-operated disconnects, gang-operated disconnects and motor-operated disconnects on a time-based maintenance cycle to assure proper operation.
Insulation Testing	Technicians perform power factor testing on power transformers, potential transformers, lightning arresters, current transformers, select circuit breakers and power cables on a time-based maintenance cycle. Testing also includes other instrument transformers, (CCVTs, coupling capacitors, potential devices, etc.). They also perform high-potential testing on12kV oil, air and vacuum circuit breakers to assure proper operation.

Program	Activity
Condition Monitoring of Station Equipment	Electricians/Technicians perform dissolved gas-in-oil, dielectric, and physical properties oil tests for oil in power transformers, and impedance and select capacity tests on station batteries, to assure equipment is within normal parameters. Periodically, AC power factor tests, hi-potential tests, contact resistance tests and motion tests are performed on circuit breakers. Oil dielectric testing is conducted for oil circuit breakers.
Thermographic Inspections	Electricians perform infrared surveys of substation facilities to identify components operating at elevated temperature. Based on the findings, engineers develop plans to repair or replace the component(s) prior to failure.
Minor Improvements	Maintenance activities may identify conditions where additions or upgrades are needed to assure reliability. Engineers evaluate the need and develop action plans and schedules to complete the work.
DC Station Service Improvements	Repairmen identify deteriorated station batteries, battery chargers and battery components. Engineers schedule repair or replacement as necessary.
Capacitor Bank Protection	Engineers monitor the need for synchronous closing schemes on vacuum switches on 69kV capacitor banks. They plan and schedule installations as needed.
Area/Regional Supply	Engineers develop specific projects aimed at improving capacity shortfalls, or replacing deteriorated or substandard station equipment.
SCADA Replacement	Engineers identify deteriorating substation SCADA equipment and develop plans to repair or replace it.

Appendix C: Distribution Programs and Procedures

Program	Activity
Load Survey – of equipment that is not continuously monitored	Line personnel measure the loading of facilities during peak periods. Engineers use this data for system studies.
Load Survey – by automatic monitoring devices	Automatic monitoring devices such as SCADA provide continuous, real-time loading information. Operators use this data to assure that loads do not exceed design limits. Engineers use this data for system studies.
Circuit Analysis	Engineers analyze circuit voltage profiles to balance loads and to identify areas requiring voltage support to maintain required voltage at the customer's facility.
Capacitor – Inspection and Maintenance	Line personnel inspect existing capacitor installations for potential failure, and inspect and maintain associated electronic control equipment to assure proper operation. Line personnel repair or replace any defective equipment.
Voltage Regulator – Inspection and Maintenance	Line personnel inspect existing equipment for potential failure, and inspect and maintain controls and tap changers to assure proper operation. Line personnel repair or replace any defective equipment.
Overhead Line Switch – Inspection and Maintenance	Line personnel inspect switch installations to identify cracked or broken insulators / bushings, stuck or misaligned blades, insulation or gasket deterioration or other operational problems. Line personnel repair or replace any defective equipment.
Transformer Maintenance	Engineers analyze customer usage data to identify overloaded transformers. Transformers that are heavily loaded are replaced with higher capacity units or portions of the load are transferred to other nearby transformers.
Wood Pole – Inspection, Maintenance, Replacement, Trussing (reinforcement)	Inspectors examine wood poles for deterioration and measure the degree of decay. Based on the results, the pole may be treated with preservative to extend its life, treated and reinforced for extended life or replaced.
Overhead Line Inspection	Line inspectors examine overhead facilities to identify damaged, deteriorated or substandard equipment. Line personnel repair or replace any defective equipment.

Program	Activity
Circuit Performance Review	Engineers use PPL Electric's Circuit Performance Index to identify worst performing circuits ("WPC") and ascertain the need for additional circuit reviews or inspections. The index is a composite of SAIFI, CAIDI, customers interrupted more than 3 times and customers with service interruptions longer than 4 hours. Actual service interruption history is analyzed to identify causal or geographic patterns.
Underground Primary Cable – Testing, Maintenance, Replacement, Curing	Line personnel perform insulation and neutral tests on cable in residential developments with potential problems to identify deteriorated cable. Based on the results, the cable is placed back in service, repaired or replaced.
LTN Maintenance	Electricians inspect, service, maintain and overhaul LTN vaults, manholes, cables, transformers, low-voltage network protectors and primary transformer disconnect switches. Based on results, defective equipment is either repaired or replaced.
Public Damaged Facilities Review	A program aimed at identifying the locations of facilities that have been damaged by public contact more than once. Technicians evaluate those installations and, if relocation is deemed appropriate, schedule work to move the facilities.
Underground Service Cable	Engineers resolve customer service problems that are due to deteriorated underground service conductors.
Oil Circuit Reclosers	Line personnel replace in-service oil circuit reclosers on a time-based maintenance cycle. Removed units are tested, and may be refurbished and placed in inventory.
Line Protection Equipment	Engineers perform load calculations to identify line protection devices that are approaching their capacity limits. Devices are replaced or upgraded to assure that they function properly.
Capacitor Installation	Engineers perform voltage profiles to determine the need, location and size of any new voltage support equipment required to maintain adequate service voltage levels at customer facilities and provide needed reactive support for system stability. Line personnel install the required equipment.

Appendix D: Vegetation Programs and Procedures

Program	Activity
Tree Pruning	Tree pruning is scheduled based on field conditions observed and/or a system prioritization process. All pruning is done in accordance with American National Standard for Tree Care Operations-Tree, Shrub and Other Woody Plant Maintenance – Standard Practices (ANSI A300).
Tree Removal	Trees, located both within the right-of-way corridor and outside the right-of-way, that represent a threat to line performance/ safety are removed when it is feasible to do so.
Herbicide Application	Tall-growing, undesirable vegetation growing within the right-of-way corridors is selectively treated with herbicides. Low-growing vegetation that does not represent a hazard to the safe, reliable operation of PPL Electric's facilities is preserved *wherever possible.*
Reclearing	Tall-growing, undesirable vegetation growing within the right-of-way corridors is selectively removed in those situations where herbicides can not be utilized. Low-growing vegetation that does not represent a hazard to the safe, reliable operation of PPL Electric's facilities is preserved wherever possible.

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Allentown, PA 18101

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