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September 29, 2017

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VIA UNITED PARCEL SERVICE

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120

SEP 29 2017

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

**Re: Biennial Inspection, Maintenance, Repair and Replacement Plan –
Pennsylvania Electric Company for the period January 1, 2019 –
December 31, 2020
Docket No. M-2009-2094773**

Dear Secretary Chiavetta:

In accordance with 52 Pa. Code § 57.198, enclosed for filing on behalf of Pennsylvania Electric Company ("Penelec") is an original and one copy of the Biennial Inspection, Maintenance, Repair and Replacement Plan (the "Plan") for the period January 1, 2019 through December 31, 2020. Please date stamp the extra copy and return it in the postage-prepaid envelope provided.

This Plan is designed consistent with the guidelines established by the National Electric Safety Code, the Codes and Practices of the Institute of Electrical and Electronic Engineers, Federal Energy Regulatory Commission Regulations, and the American National Standards Institute, Inc. The Plan also has been designed to reduce the risk of outages on Penelec's system and form the basis of its inspection and maintenance goals and objectives as outlined in Penelec's annual and quarterly reliability reports filed with the Pennsylvania Public Utility Commission ("Commission").

Penelec respectfully requests that the Commission accept its Biennial Inspection, Maintenance, Repair and Replacement Plan. If you have any questions, please contact me or Tiffanne Cowan at (330) 761-4474.

Sincerely,


Tori L. Giesler

dln
Enclosure

c: D. Searfoorce

**Biennial Inspection, Maintenance, Repair and Replacement
Plan of Pennsylvania Electric Company ("Penelec")**

For the period of January 1, 2019 – December 31, 2020

**Submitted by:
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Revisions to Approved Plan

The Commission accepted Pennsylvania Electric Company's ("Penelec" or "Company") current Biennial Inspection, Maintenance, Repair and Replacement Plan ("I&M Plan") for 2017 and 2018 on December 15, 2015. Penelec's proposed I&M Plan for 2019 and 2020 is consistent with its previously approved plan for 2017 and 2018 and proposes no substantive changes to its inspection cycles or plan components.

Section 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

Penelec performs vegetation management on its distribution circuits to promote the continued safe and reliable operation of its distribution system. Vegetation management may be performed utilizing one of three methods: standard specification, inspect and maintain, or enhanced specification. The standard specification for vegetation management is designed to support line reliability, maintain access, make repairs, or restore service and to support safe and reliable service. The standard specification prunes vegetation to achieve five years of clearance, and includes the removal of selected incompatible trees within the clearing zone corridor, removal of certain defective limbs that are overhanging primary conductors, controlling selected incompatible brush mechanically and/or using herbicide, and removal of off-corridor priority trees that are dead, dying, diseased, and leaning or significantly encroaching the corridor.

Portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to receive enhanced specification vegetation removal techniques. This includes the removal of certain healthy limbs which overhang primary conductors based on tree species and condition.

For portions of a circuit that have not experienced significant reliability issues due to vegetation-caused outages, a proactive inspect and maintain process will target selective vegetation removal for continued reliable system operation. This may include the extension of a cycle, not to exceed a total of eight years. This process involves inspection of the vegetation to evaluate the extent of potential for vegetation to interfere with energized conductors. Factors to consider in the evaluation are the voltage and height of the conductor, the type of tree, its growth rate, and branching habit. Trees that will impact safety or reliability will be maintained to the standard specification.

Methods used to manage and control vegetation include manual control methods using hand-operated tools, mechanical control using equipment-mounted saws, mowers or other devices, and various herbicide application techniques such as, selective basal herbicide applications, stem foliage applications and cut stubble applications.

Further detailed information regarding Penelec's vegetation management program may be found in the Vegetation Management Distribution Specifications.

Inspection Plan¹

Area		Inspections and Treatments Planned (Total Circuit Miles)	
		2019	2020
Penelec 18,076 total circuit miles	Altoona 2,004 total circuit miles	401	401
	Clearfield 1,659 total circuit miles	332	332
	Dubois 1,589 total circuit miles	318	318
	Erie 2,373 total circuit miles	475	475
	Johnstown 1,781 total circuit miles	356	356
	Lewistown 1,452 total circuit miles	290	290
	Oil City 1,971 total circuit miles	394	394
	Towanda 4,012 total circuit miles	802	802
	Warren 1,235 total circuit miles	247	247

Section 57.198(c). Time frames. *The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.*

Justification

Distribution vegetation management activities are performed in accordance with the following:

- Accepted industry practices
- ANSI Z133.1 and A-300 Standards and according to the requirements given by the Occupational Safety and Health Administration ("OSHA") and the National Electrical Safety Code ("NESC")

¹ The total number of circuit miles to be trimmed in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

All vegetation management activities are designed to achieve cycle length clearances, regardless of method employed. The standard specification seeks to control all vegetation in the space defined as the distribution clearing zone. The distribution clearing zone is the right-of-way corridor measured at a horizontal distance of fifteen feet on either side of the pole line or the established large tree edge, whichever is greater in width. The corridor is measured vertically to fifteen feet above the highest conductor attached to the pole or structure. Enhanced specification techniques may be applied to select line sections. This practice involves the removal of overhanging limbs outside the right-of-way as well as aggressive mitigation of hazard trees.

As part of Penelec's approach to improving tree related reliability, the Company continues to analyze circuit electrical protection schemes and gives added attention to select line sections, such as those that serve high numbers of customers. Three distinct line sections have been identified and defined under existing protection schemes, as shown in the table below.

Zone 1	Zone 2	Zone 3
Three-phase circuitry from the circuit breaker to the first protective device	Three-phase circuitry beyond the first protective device	Single-phase and two-phase circuitry
Serves entire customer load	Serves a large percentage of customer load	Serves smallest percentage of customer load

In addition to Penelec's Distribution Vegetation Management Program, there are other distribution equipment inspection programs (e.g., Distribution Pole Inspections, Distribution Overhead Line Inspections, Distribution Transformer Inspections and Recloser Inspections) that allow trained utility personnel multiple opportunities to observe conditions on the distribution system. These conditions may include vegetation management situations that warrant further investigation.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.

Section 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

Penelec shall visually inspect distribution wood poles on a twelve-year cycle. The purpose for inspecting distribution wood poles is to identify and repair unsafe conditions or conditions that may adversely affect service reliability or system performance, and to comply with the state regulatory agencies and the National Electrical Safety Code ("NESC").

This preventative maintenance inspection for wood poles will include a visual inspection as well as hammer-sounding as needed. The inspection consists of the recording of abnormal conditions from the groundline to the top of the pole including but not limited to the following:

- Damage – broken or leaning
- Equipment – crossarms, insulators, conductors, oil leaking
- Testing for decayed internal wood

In addition to the visual inspection, poles showing incipient decay or poles that are thirty-five years old or older will be bored to further assess the condition of the pole. This inspection consists of the recording of tests performed and abnormal conditions detected including but not limited to the following:

- Boring – testing for internal decay
- Verification of shell thickness

Further detailed information regarding Penelec's inspection of wood poles may be found in the Distribution Inspection & Maintenance Practice – Wood Pole Groundline.

Inspection Plan²

	Area	Pole Inspections Planned (Number of Poles)	
		2019	2020
Penelec 499,010 total poles	Altoona 58,798 total poles	4,900	4,900
	Clearfield 39,059 total poles	3,255	3,255
	Dubois 46,211 total poles	3,851	3,851
	Erie 73,669 total poles	6,139	6,139
	Johnstown 59,839 total poles	4,986	4,986
	Lewistown 35,877 total poles	2,990	2,990
	Oil City 57,247 total poles	4,770	4,770
	Towanda 90,331 total poles	7,528	7,528
	Warren 37,979 total poles	3,165	3,165

Section 57.198(n)(3). 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, then the pole shall be replaced within 30 days of the date of inspection.*

Corrective Maintenance

Wood poles and supporting structures with recorded defects that Penelec could expect to create an immediate risk to public or employee safety or affect the integrity of the circuit shall be repaired or replaced within thirty days. All remaining deficiencies will be evaluated and prioritized on a case-by-case basis.

² The total number of poles to be inspected in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

Section 57.198(c). Time frames. *The plan must comply with the inspection and maintenance standards set forth in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.*

Justification

Penelec's twelve-year inspection cycle for wood poles is based on accepted electric utility practices. The NESC Rule 12.121.A states "Electric equipment shall be inspected and maintained at such intervals as experience has shown to be necessary." Twelve years between inspections allows enough time for proper planning and remediation prior to any problems negatively impacting personal safety, equipment integrity or service reliability.

Rather than conducting load calculations as part of each pole inspection, Penelec follows the practice of creating base line designs using FirstEnergy's Distribution Line Construction Standards and Distribution Engineering Practices. FirstEnergy's Construction Standards are based on and updated each time a revised NESC Heavy Loading Standard is issued. The majority of FirstEnergy's service territory lies within the heavy loading zone and these standards provide basic guidance for most designs encountered by distribution line design personnel. All new facilities are designed consistent with NESC Heavy Loading Standard NESC C2-2012, Section 250. The Engineering Practices provide detailed guidance for both guying and pole loading, and additional engineering support is available to designers when more complex calculations are needed. Per the NESC, both of these resources include safety factors such that the deterioration of poles in service shall not reduce the strength capability of the pole below the required strength. Further, as the Company receives requests from other entities to attach their facilities to Penelec's poles, an assessment, ranging from a visual inspection to a full strength analysis, is performed based on pole attachment guidelines, experience and the situation encountered.

In addition to Penelec's Distribution Pole Inspection Program, there are other distribution equipment inspection programs (e.g., Distribution Vegetation Management, Distribution Overhead Line Inspections, Distribution Transformer Inspections and Recloser Inspections) that allow trained utility personnel multiple opportunities to observe conditions on the distribution system. These conditions may include distribution pole situations that warrant further investigation.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.

Section 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 distribution line*
- iii. Other conditions that may adversely affect operation of the overhead distribution line*

Program Description

Penelec shall visually inspect distribution overhead lines and equipment on a five-year cycle. The purpose for inspecting overhead lines and equipment is to identify and repair unsafe conditions or conditions that may adversely affect service reliability, and to comply with the requirements of state regulatory agencies and the National Electrical Safety Code ("NESC"). This program shall be limited to overhead facilities.

Circuits will be inspected on a five-year cycle to help levelize labor commitments and expenses. This preventative maintenance will consist of a visual inspection and recording of abnormal conditions including but not limited to the following types of overhead circuit equipment:

- Conductors (wire and cable) – excessive slack, condition, damage, clearances
- Supporting structures (wood poles) – deteriorated condition, sustained damage (lightning, vehicle, woodpecker holes)
- Pole hardware (including insulators) – condition, damage
- Guying – condition, damage
- Pole-mounted distribution equipment (including overhead transformers) – condition, damage
- Switches
- Sectionalizers

Further detailed information regarding Penelec's inspection of Distribution Overhead Lines may be found in the Distribution Inspection & Maintenance Practice – Overhead Circuits and Equipment.

Inspection Plan³

Area		Overhead Line Inspections Planned (Number of Circuits)	
		2019	2020
Penelec 1,252 total circuits	Altoona 172 total circuits	37	30
	Clearfield 65 total circuits	14	12
	Dubois 95 total circuits	19	24
	Erie 203 total circuits	39	41
	Johnstown 134 total circuits	27	23
	Lewistown 84 total circuits	15	19
	Oil City 141 total circuits	28	28
	Towanda 262 total circuits	53	51
	Warren 96 total circuits	20	24

Section 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

Supporting structures with recorded defects that Penelec could reasonably expect to affect the integrity of the circuit shall be repaired or replaced within thirty days. All remaining deficiencies will be evaluated and prioritized on a case-by-case basis.

Section 57.198(c). Time frames. The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.

³ The total number of circuits to be inspected in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

Justification

Penelec's five-year inspection cycle for overhead lines is based on accepted electric utility practices. The NESC Rule 12.121.A states "*Electric equipment shall be inspected and maintained at such intervals as experience has shown to be necessary.*" Penelec's experience has shown the five-year inspection cycle to be successful in addressing problems in a timely manner, allowing for proper planning and remediation prior to the problem negatively impacting personal safety, equipment integrity or service reliability.

In addition to Penelec's Distribution Overhead Line Inspection Program, there are other distribution equipment inspection programs (e.g., Distribution Vegetation Management, Distribution Pole Inspections, Distribution Transformer Inspections and Recloser Inspections) that allow trained utility personnel multiple opportunities to observe conditions on the distribution system. Further, field personnel perform circuit assessments to address specific reliability concerns and to assess worst performing circuit performance. Lastly, Penelec may use infrared thermography on an as-needed basis on certain worst performing circuits or while performing circuit rehabilitation.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.

Section 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

Penelec visually inspects overhead distribution transformers as part of the overhead line inspection. Above-ground pad-mounted transformers are inspected on a five-year cycle and below-ground transformers are inspected on an eight-year cycle. The purpose for inspecting distribution transformers is to identify and repair unsafe conditions or conditions that may adversely affect service reliability, and to comply with the requirements of state regulatory agencies and the National Electrical Safety Code ("NESC").

Overhead distribution transformers – visual inspection and recording of abnormal conditions including but not limited to the following:

- Equipment condition – oil leakage, arresters, rust, dents or evidence of contact

Above-ground pad-mounted equipment (transformers and switchgear) – inspection and recording of abnormal conditions including but not limited to the following:

- Equipment condition – oil leakage, cabinet damage, holes, washout
- Security – locking mechanisms
- Accessibility – as required for operation and maintenance purposes, including installation of fences or shrubbery that could adversely affect access to and operation of the transformer and unauthorized excavation or changes in grade near the transformer
- Warning labels – electrical hazard warning label and landscaping instructions notice

Below-ground transformers – visual inspection and recording of abnormal conditions including but not limited to the following:

- Accessibility – verify cover is secured
- Equipment condition – visually inspect baffle

Further detailed information regarding Penelec's inspection of distribution transformers may be found in the Distribution Inspection & Maintenance Practice – Underground Equipment.

Inspection Plan⁴

			Transformer Inspections Planned (Total Number of Transformers)	
Area			2019	2020
Penelec 196,916 total transformers	Altoona 28,674 total transformers	Overhead Transformers 23,513 total transformers	5,263	4,505
		Above-Ground Pad-mounted 4,866 total transformers	1,007	886
		Below-Ground Transformers 295 total transformers	53	61
	Clearfield 16,626 total transformers	Overhead Transformers 15,116 total transformers	2,515	3,395
		Above-Ground Pad-mounted 1,360 total transformers	320	212
		Below-Ground Transformers 150 total transformers	19	25
	Dubois 16,891 total transformers	Overhead Transformers 14,546 total transformers	2,936	3,839
		Above-Ground Pad-mounted 2,148 total transformers	353	644
		Below-Ground Transformers 197 total transformers	36	58
	Erie 27,543 total transformers	Overhead Transformers 22,324 total transformers	4,231	3,869
		Above-Ground Pad-mounted 5,100 total transformers	823	1,031
		Below-Ground Transformers 119 total transformers	24	13
	Johnstown 23,183 total transformers	Overhead Transformers 19,692 total transformers	4,316	2,820
		Above-Ground Pad-mounted 3,303 total transformers	620	568
		Below-Ground Transformers 188 total transformers	40	41
	Lewistown 16,265 total transformers	Overhead Transformers 13,461 total transformers	2,112	2,916
		Above-Ground Pad-mounted 2,636 total transformers	481	420
		Below-Ground Transformers 168 total transformers	39	28

⁴ The total number of distribution transformers to be inspected in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

Area		Type	Transformer Inspections Planned (Total Number of Transformers)	
			2019	2020
Penelec 196,916 total transformers	Oil City 20,992 total transformers	Overhead Transformers 18,456 total transformers	3,503	2,986
		Above-Ground Pad-mounted 2,366 total transformers	542	365
		Below-Ground Transformers 170 total transformers	57	46
	Towanda 33,363 total transformers	Overhead Transformers 30,240 total transformers	6,844	5,713
		Above-Ground Pad-mounted 2,892 total transformers	597	590
		Below-Ground Transformers 231 total transformers	36	29
	Warren 13,379 total transformers	Overhead Transformers 12,232 total transformers	2,154	4,426
		Above-Ground Pad-mounted 1,121 total transformers	186	291
		Below-Ground Transformers 26 total transformers	3	8

Section 57.198(c). Time frames. *The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.*

Justification

Penelec's five- and eight-year inspection cycles for distribution transformers are based on accepted electric utility practices and the experience of Penelec. The NESC Rule 12.121.A states "Electric equipment shall be inspected and maintained at such intervals as experience has shown to be necessary."

Penelec's experience has proven the inspection cycles above to be successful in addressing problems in a timely manner, allowing for proper planning and remediation prior to the problem negatively impacting personal safety, equipment integrity or service reliability.

In addition to Penelec's Distribution Transformer Inspections Program, there are other distribution equipment inspection programs (e.g., Distribution Vegetation Management, Distribution Pole Inspections, and Recloser Inspections) that allow trained utility personnel multiple opportunities to observe conditions on the distribution system. These conditions may include distribution transformer situations that warrant further investigation.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.

Section 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

Penelec visually inspects distribution line reclosers annually. The purpose for inspecting distribution line reclosers is to identify and repair unsafe conditions or conditions that may adversely affect service reliability or system performance, and to comply with the requirements of state regulatory agencies and the National Electrical Safety Code ("NESC").

The annual preventative maintenance consists of counter readings and field inspection. The counter readings are obtained to assess system performance based on the number of operations. The field inspection includes but is not limited to the following:

- Type of recloser and current rating
- Counter reading
- Condition – rust, dents, physical damage, leaks, lightning damage
- Equipment – surge arresters, tank-ground connections, by-pass switches, control battery, pole
- Grounds – damage, condition

Further detailed information regarding Penelec's inspection of reclosers may be found in the Distribution Inspection & Maintenance Practice – Line Reclosers.

Inspection Plan⁵

	Area	Type	Recloser Inspections Planned (Total Number of Reclosers)	
			2019	2020
Penelec 2,575 total reclosers	Altoona 357 total reclosers	Single Phase 269 total reclosers	269	269
		Three Phase 88 total reclosers	88	88
	Clearfield 275 total reclosers	Single Phase 232 total reclosers	232	232
		Three Phase 43 total reclosers	43	43
	Dubois 145 total reclosers	Single Phase 86 total reclosers	86	86
		Three Phase 59 total reclosers	59	59
	Erie 432 total reclosers	Single Phase 349 total reclosers	349	349
		Three Phase 83 total reclosers	83	83
	Johnstown 127 total reclosers	Single Phase 39 total reclosers	39	39
		Three Phase 88 total reclosers	88	88
	Lewistown 180 total reclosers	Single Phase 145 total reclosers	145	145
		Three Phase 35 total reclosers	35	35
	Oil City 398 total reclosers	Single Phase 330 total reclosers	330	330
		Three Phase 68 total reclosers	68	68
	Towanda 427 total reclosers	Single Phase 344 total reclosers	344	344
		Three Phase 83 total reclosers	83	83
	Warren 234 total reclosers	Single Phase 200 total reclosers	200	200
		Three Phase 34 total reclosers	34	34

⁵ The total number of recloser units to be inspected in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

Section 57.198(c). Time frames. *The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.*

Justification

Penelec's annual inspection cycle for reclosers is based on accepted electric utility practices and the experience of Penelec. The NESC Rule 12.121.A states "*Electric equipment shall be inspected and maintained at such intervals as experience has shown to be necessary.*" One year between inspection cycles has proven to be successful in addressing problems in a timely manner, allowing for proper planning and remediation prior to the problem negatively impacting personal safety, equipment integrity or service reliability.

In addition to Penelec's Recloser Inspections Program, there are other distribution equipment inspection programs (e.g., Distribution Vegetation Management, Distribution Pole Inspections, Distribution Overhead Line Inspections, and Distribution Transformer Inspections) that allow trained utility personnel multiple opportunities to observe conditions on the distribution system. These conditions may include recloser equipment situations that warrant further investigation.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.

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

Program Description

Penelec inspects its distribution substations twelve times annually. The purpose of monthly inspections of the distribution substations is to ensure that any developing substation problems are identified and addressed in a timely manner in support of system reliability and electrical safety.

There are three types of preventative maintenance inspections that are performed at Penelec substations during a twelve-month period. The chart below illustrates the type of inspection performed each month⁶:

Inspection Type	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Safety and Security of Facilities/Visual Equipment Inspection/Reporting and Recording of Deficiencies and Relay Operations (Class C)	X	X	X	X	X	X	X	X	X	X	X	X
Safety/Security, Visual Equipment Inspection and Record Readings (Class B)			X			X			X			X
Seasonal Maintenance (Class A)			X						X			

The following is a summary of each type of inspection that is conducted at Penelec substations:

1. *Safety and Security of Facilities and Visual Equipment Inspection of Electrical Equipment and Reporting/Recording Identified Deficiencies and Relay Operations (Class C).* Monthly visual inspection of substation equipment, structures and hardware that also includes the recording of abnormal conditions or deficiencies. This inspection may include but is not limited to the following:
 - General condition – read and record ambient temperature
 - Perimeter fence inspection (gate locks, fence and gate grounds, warning signs)
 - Yard and facility inspection (equipment grounds, vegetation condition, general yard condition, equipment condition, oil levels and leaks, structure/hardware condition, hotspots, conductors/switches/connections)
 - Building inspection (security, integrity, indication lights)
 - Visual inspection of major equipment (power transformers, circuit breakers, instrument transformers, etc.)
 - Relays, electronic controls, and panel meters for alarms and targets
 - Batteries and chargers
2. *Safety and Security, Visual Equipment Inspection and Record Readings (Class B).* In addition to the safety and security and visual equipment inspection that is performed monthly, every three months an additional visual inspection that

⁶ For illustrative purposes only.

includes the recording of readings is performed. This inspection may include but is not limited to all items listed under the Class C inspection as well as the following types of substation equipment:

- Recording of amps and load readings
- Recording of counter and gauge readings
- Inspection/test of carrier communication equipment
- Inspection of microwave/radio sites and engine generators – generator alarms and battery

3. *Seasonal Maintenance - Summer and Winter Readiness (Class A).* In addition to the monthly and three-month inspections, every six months a more comprehensive inspection of the substation and substation equipment is performed. This inspection may include but is not limited to all items listed under the Class C and B inspections as well as the following types of substation equipment:

- Servicing fire protection equipment
- Servicing eye wash stations
- Yard lighting
- Servicing filters and HVAC systems
- Servicing of equipment cabinet heaters
- Servicing engine generators

Further detailed information regarding Penelec's inspection of substations may be found in Section 20P – Substation Patrol Inspection of the Substation Maintenance Practice and Methods.

Inspection Plan⁷

Area		Substation Inspections Planned (Number of Substations)	
		2019	2020
Penelec 400 total substations	Altoona 68 substations	816	816
	Clearfield 52 substations	624	624
	Erie 42 substations	504	504
	Indiana 12 substations	144	144
	Lewistown 37 substations	444	444
	Mansfield 21 substations	252	252
	Montrose 28 substations	336	336
	Oil City 35 substations	420	420
	Richland 48 substations	576	576
	Towanda 31 substations	372	372
	Warren 26 substations	312	312

Section 57.198(c). Time frames. *The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided that the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will support the level of reliability required by law.*

Justification

Patrol inspections of distribution substations are performed on a monthly, quarterly and semi-annual basis, with a tiered approach to preventative maintenance. This tiered approach has proven effective in addressing emerging problems and allows for proper

⁷ The total number of substations to be inspected in 2019 and 2020 was based on the current system configuration (as of 2017) and thus is subject to change by the time the 2019 and 2020 plans commence.

planning and remediation prior to the problem negatively impacting personal safety, equipment integrity or service reliability.

Monthly inspections ensure a trained, physical presence within the substation. Frequent, in-person inspections have been effective in detecting the degradation of facilities not always captured by existing local and remote surveillance and monitoring tools. In addition to visual inspections, load and counter readings are recorded every three months to allow local engineering to conduct planning and load studies. Finally, an intensive inspection is conducted two times a year, in spring and fall.

Advancements in technology have refined how substation equipment inspections are performed, and those advancements have been leveraged to ensure the highest levels of safety and reliability of the substations and substation equipment. For example, results from equipment and patrol inspections are captured by field personnel on site and entered directly into the maintenance database where they can be tracked. Through the use of historical inspection data and enhanced software, Penelec is able to target specific equipment and trigger maintenance based on equipment condition. For example, counter readings that are obtained during the three-month inspection cycle are used to trigger condition-based maintenance. Both predictive and condition-based programs extend the operating life of the equipment. They also optimize the necessary maintenance interval, improve service reliability, and reduce downtime that is typically experienced when equipment is taken off line which reduces exposure of the grid, all with consistency and efficiency.

Section 57.198(m). Record Keeping. *Maintain records of inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs.*

In order to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs, Penelec will maintain inspection and maintenance records either electronically or in hard copy as required by state law.