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October 1, 2019

VIA UPS OVERNIGHT DELIVERY

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

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

**Re: Biennial Inspection, Maintenance, Repair and Replacement Plan –
Pennsylvania Electric Company for the period January 1, 2021 –
December 31, 2022
Docket No.**

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, 2021 through December 31, 2022. 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 Laurel Klingensmith at (330) 374-6672.

Very truly yours,



Teresa K. Harrold

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Enclosure

c: D. Searforce

**Biennial Inspection, Maintenance, Repair and
Replacement Plan for Pennsylvania Electric Company**

For the period of January 1, 2021 – December 31, 2022

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**Submitted by:
Scott R. Wyman
President, Pennsylvania Operations
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Greensburg, PA 15601
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Introduction

Pursuant to 52 Pa. Code § 57.198(a), every two years an electric distribution company shall file with the Pennsylvania Public Utility Commission (“Commission”) a biennial plan for the periodic inspection, maintenance, repair and replacement of its facilities. Pennsylvania Electric Company (“Penelec” or “Company”) hereby submits its Biennial Inspection, Maintenance, Repair and Replacement Plan (“I&M Plan”) for the period January 1, 2021 through December 31, 2022 in accordance with the relevant parts of 52 Pa. Code § 57.198.

System Assessment

Penelec serves more than 580,000 Pennsylvania customers and the service territory covers nearly 10,000 square miles. From the physical field employees up to and including top management, Penelec is committed to providing customers with safe and reliable electric service. Methods to improve the efficiency, adequacy and reliability of the distribution system are a continual focus and every employee has an investment in each of the Company’s respective reliability metrics. In addition to the I&M Plan, Penelec utilizes core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- **Vegetation Management**
 - In response to damage caused by the Emerald Ash Borer, a program to proactively remove Ash Trees off right-of-way was implemented.
 - Post-storm vegetation circuit patrols target the areas with high tree-related outages. These patrols identify trees damaged in a storm that may eventually lead to a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as a part of the patrol is repaired or replaced.
- **Customers Experiencing Multiple Interruptions (“CEMI”)**
 - The CEMI program is aimed to reduce frequent or repeated outages for affected clusters of customers or frequently operated devices.
- **Load Forecasting and Distribution Planning**
 - The load forecasting application is used to estimate future substation and circuit loading based upon historical load data and the planning criteria guidelines are then used to provide a consistent approach for planning the safe, reliable, orderly, and economic expansion of the distribution system.
- **Circuit Protection**
 - The circuit protection practices are aimed at achieving safety and security for the public and employees, maximizing service reliability to customers, minimizing damage to distribution equipment, and establishing a consistent process and set of application standards for distribution circuit protection.
- **Long-Term Infrastructure Improvement Plans (“LTIIP”)**

- Penelec first began to execute its LTIP programs in 2016. These plans include expenditures and programs designed to adequately maintain and improve the efficiency, safety, adequacy and reliability of the distribution system. Most recently, the Company filed its second LTIP covering the period 2020 through 2024.

Plan Revisions

Penelec submitted its I&M Plan for the period January 1, 2019 through December 31, 2020 on September 29, 2017, which was deemed approved pursuant to 52 Pa. Code § 57.198(i).

Penelec's proposed I&M Plan for 2021 and 2022 is consistent with its previously approved plan for 2019 and 2020 and proposes no substantive changes to its inspection cycles or plan components.

Plan Consistency

Section 57.198(b). Plan Consistency. The plan must be consistent with the National Electrical 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.

Penelec's I&M Plan and associated inspection activities are performed in accordance with the Occupational Safety and Health Administration, National Electrical Safety Code ("NESC"), 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., as applicable.

Record Keeping

Section 57.198(m). Record Keeping. An electric distribution company ("EDC") must 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.

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Vegetation Management

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 in order to promote the continued safe and reliable operation of its distribution system. The vegetation management program specification is designed to support line reliability, maintain access, make repairs, or restore service and to support safe and reliable service. The vegetation management program specification prunes vegetation to achieve five years of clearance and includes 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, relieving limbs causing mechanical strain on secondary/service lines 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 include 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 inspection 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 vegetation management program 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. Removing incompatible vegetation may also include various herbicide application techniques such as, high volume foliage application, low volume foliage application, basal herbicide applications, stump applications, frill application, aerial application, bare soil treatment application and cut stubble applications. All herbicides shall be applied in accordance with all state, local and federal laws governing the use of herbicides.

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

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.

Program Justification

In addition to complying with the provisions in Section 57.198(b), distribution vegetation management activities are performed in accordance with the Pennsylvania Pesticide Control Act, the Pennsylvania Administrative Code, and the Utility Arborist Association's Field Guide to Closed Chain of Custody for Herbicides in the Utility Vegetation Management Industry. All vegetation management activities are designed to achieve cycle length clearances, regardless of method employed. The vegetation management program specification seeks to maintain and 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. Penelec has also applied a specific vegetation management approach 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, with the intent of improving tree related reliability on the selected line sections.

Penelec's professional vegetation management staff performs inspections and approves all work conducted by vegetation management contractors. The Forestry personnel maintain an understanding of current and emerging techniques by attending industry trade conferences and maintaining memberships in industry trade organizations, such as Utility Arborist Association and the International Society of Arboriculture. The goal of the vegetation management department is to manage distribution corridors in a way that provides safe and reliable electricity while simultaneously working to make a sustainable habitat system on Penelec's rights-of-way.

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.

Inspection Plan

The total number of circuit miles to be trimmed in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

	Area	Inspections and Treatments Planned <i>Total Circuit Miles</i>	
		2021	2022
Penelec <i>18,076 total circuit miles</i>	Altoona <i>2,004 total circuit miles</i>	401	401
	Clearfield <i>1,659 total circuit miles</i>	332	332
	Dubois <i>1,589 total circuit miles</i>	318	318
	Erie <i>2,373 total circuit miles</i>	475	475
	Johnstown <i>1,781 total circuit miles</i>	356	356
	Lewistown <i>1,452 total circuit miles</i>	290	290
	Oil City <i>1,971 total circuit miles</i>	394	394
	Towanda <i>4,012 total circuit miles</i>	802	802
	Warren <i>1,235 total circuit miles</i>	247	247

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Distribution Pole Inspections

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 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](#).

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.

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.*

Program 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.

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.

Pole Loading Calculation

As a part of the I&M Plan for the period January 1, 2019 through December 31, 2020, the Commission previously exempted Penelec from conducting pole loading calculations as a part of its pole inspections. Penelec requests a continuation of the exemption for the currently proposed period.

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 the Company'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 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.

Inspection Plan

The total number of poles to be inspected in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

Area	Pole Inspections Planned (Number of Poles)	
	2021	2022
Altoona <i>58,775 total poles</i>	6,825	5,704
Clearfield <i>39,007 total poles</i>	1,891	2,830
Dubois <i>46,201 total poles</i>	2,274	4,762
Erie <i>73,712 total poles</i>	7,611	7,621
Johnstown <i>59,872 total poles</i>	6,489	6,824
Lewistown <i>35,849 total poles</i>	4,080	2,366
Oil City <i>57,091 total poles</i>	4,381	4,236
Towanda <i>90,544 total poles</i>	5,592	5,170
Warren <i>37,929 total poles</i>	2,439	2,069
Penelec <i>498,980 total poles</i>		

Distribution Overhead Line Inspections

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 NESC. This program shall be limited to overhead facilities.

Circuits will be inspected on a five-year cycle to 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.

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.*

Program Justification

As a part of the I&M Plan for the period January 1, 2019 through December 31, 2020, the Commission previously granted a waiver for overhead circuit inspection periodicity. Penelec requests a continuation of the waiver for the currently proposed period.

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.

Inspection Plan

The total number of circuits to be inspected in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

		Overhead Line Inspections Planned	
		<i>(Number of Circuits)</i>	
Area		2021	2022
Penelec <i>1,242 total circuits</i>	Altoona <i>173 total circuits</i>	37	33
	Clearfield <i>64 total circuits</i>	12	13
	Dubois <i>95 total circuits</i>	11	18
	Erie <i>201 total circuits</i>	44	39
	Johnstown <i>134 total circuits</i>	31	27
	Lewistown <i>81 total circuits</i>	14	17
	Oil City <i>141 total circuits</i>	28	30
	Towanda <i>257 total circuits</i>	49	53
	Warren <i>96 total circuits</i>	16	17

Distribution Transformer Inspections

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 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 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 the 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.

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.

Program Justification

As a part of the I&M Plan for the period January 1, 2019 through December 31, 2020, the Commission previously granted a waiver for distribution transformer inspection periodicity. Penelec requests a continuation of the waiver for the currently proposed period.

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.

Inspection Plan

The total number of distribution transformers to be inspected in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

	Area	Type	Transformer Inspections Planned (Total Number of Transformers)	
			2021	2022
Penelec <i>181,003 total transformers</i>	Altoona <i>26,383 total transformers</i>	Overhead Transformers <i>20,878 total transformers</i>	4,541	3,745
		Above-Ground Pad-mounted <i>5,218 total transformers</i>	1,433	769
		Below-Ground Transformers <i>287 total transformers</i>	92	27
	Clearfield <i>15,951 total transformers</i>	Overhead Transformers <i>14,157 total transformers</i>	3,024	2,898
		Above-Ground Pad-mounted <i>1,638 total transformers</i>	417	262
		Below-Ground Transformers <i>156 total transformers</i>	39	27
	Dubois <i>15,346 total transformers</i>	Overhead Transformers <i>12,827 total transformers</i>	1,264	2,766
		Above-Ground Pad-mounted <i>2,335 total transformers</i>	172	437
		Below-Ground Transformers <i>184 total transformers</i>	24	25
	Erie <i>24,338 total transformers</i>	Overhead Transformers <i>18,970 total transformers</i>	4,568	3,794
		Above-Ground Pad-mounted <i>5,250 total transformers</i>	1,061	1,034
		Below-Ground Transformers <i>118 total transformers</i>	28	24
	Johnstown <i>21,239 total transformers</i>	Overhead Transformers <i>17,593 total transformers</i>	4,628	3,395
		Above-Ground Pad-mounted <i>3,460 total transformers</i>	1,101	534

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		Below-Ground Transformers <i>186 total transformers</i>	29	50
Lewistown <i>15,466 total transformers</i>		Overhead Transformers <i>12,458 total transformers</i>	2,215	3,052
		Above-Ground Pad-mounted <i>2,839 total transformers</i>	694	617
		Below-Ground Transformers <i>169 total transformers</i>	18	39
Oil City <i>18,720 total transformers</i>		Overhead Transformers <i>16,022 total transformers</i>	2,835	3,413
		Above-Ground Pad-mounted <i>2,532 total transformers</i>	335	563
		Below-Ground Transformers <i>166 total transformers</i>	13	35
Towanda <i>31,697 total transformers</i>		Overhead Transformers <i>28,307 total transformers</i>	5,192	5,303
		Above-Ground Pad-mounted <i>3,148 total transformers</i>	597	725
		Below-Ground Transformers <i>242 total transformers</i>	88	59
Warren <i>11,863 total transformers</i>		Overhead Transformers <i>10,694 total transformers</i>	1,620	1,687
		Above-Ground Pad-mounted <i>1,144 total transformers</i>	132	215
		Below-Ground Transformers <i>25 total transformers</i>	1	2

Recloser Inspections

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 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.

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.

Program 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.

Inspection Plan

The total number of recloser units to be inspected in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

	Area	Type	Recloser Inspections Planned	
			Total Number of Reclosers	
			2021	2022
Penelec <i>2,588 total reclosers</i>	Altoona <i>356 total reclosers</i>	Single Phase <i>265 total reclosers</i>	265	265
		Three Phase <i>91 total reclosers</i>	91	91
	Clearfield <i>268 total reclosers</i>	Single Phase <i>220 total reclosers</i>	220	220
		Three Phase <i>48 total reclosers</i>	48	48
	Dubois <i>145 total reclosers</i>	Single Phase <i>83 total reclosers</i>	83	83
		Three Phase <i>62 total reclosers</i>	62	62
	Erie <i>441 total reclosers</i>	Single Phase <i>345 total reclosers</i>	345	345
		Three Phase <i>96 total reclosers</i>	96	96
	Johnstown <i>131 total reclosers</i>	Single Phase <i>43 total reclosers</i>	43	43
		Three Phase <i>88 total reclosers</i>	88	88
	Lewistown <i>183 total reclosers</i>	Single Phase <i>147 total reclosers</i>	147	147
		Three Phase <i>36 total reclosers</i>	36	36
	Oil City <i>413 total reclosers</i>	Single Phase <i>346 total reclosers</i>	346	346
		Three Phase <i>67 total reclosers</i>	67	67
	Towanda <i>417 total reclosers</i>	Single Phase <i>328 total reclosers</i>	328	328
		Three Phase <i>89 total reclosers</i>	89	89
	Warren <i>234 total reclosers</i>	Single Phase <i>201 total reclosers</i>	201	201
		Three Phase <i>33 total reclosers</i>	33	33

Substation Inspections

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 these 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 the preventative maintenance inspections that are performed at Penelec substations during a twelve-month period. The chart below illustrates the type of inspection performed each month¹:

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)

¹ For illustrative purposes only.

- 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 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.

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.*

Program 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 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 substation 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.

Inspection Plan

The total number of substations to be inspected in 2021 and 2022 is based on the current system configuration (as of 2019) and thus is subject to change by the time the 2021 and 2022 plans commence.

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Area		Substation Inspections Planned <i>Number of Substations</i>	
		2021	2022
Penelec <i>417 total substations</i>	Altoona <i>60 substations</i>	720	720
	Clearfield <i>52 substations</i>	624	624
	Erie <i>43 substations</i>	516	516
	Huntington <i>21 substations</i>	252	252
	Indiana <i>13 substations</i>	156	156
	Lewistown <i>26 substations</i>	312	312
	Mansfield <i>22 substations</i>	264	264
	Oil City <i>36 substations</i>	432	432
	Richland <i>57 substations</i>	684	684
	Towanda <i>32 substations</i>	384	384
	Tunkhannock <i>28 substations</i>	336	336
Warren <i>27 substations</i>	324	324	

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