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INTRODUCTION

This document provides an overview of National Grid's Inspection and Maintenance Program for Transmission & Sub-Transmission assets.. Individual activities are listed in Tables 1 & 2 below with the specifics in separate Electric Operating Procedures. These inspections apply to National Grid Transmission and Sub-Transmission assets as listed:

	Transmission	Sub Transmission
New England	69kV & Above	23kV to 46kV
New York	115kV and Above	23kV to 69kV

Table 1

Transmission System			
Maintenance Inspection	NE Interval	NY Interval	NG - Electric Operating Procedure
Ground Level Visual Inspection	5 Years	5 Years	NG-EOP T007.01
Aerial Visual Inspection	6 Months	1 Year ¹	NG-EOP T007.02
Electrical Connector Inspection and Maintenance (Infrared Inspection)	1 Year	1 Year	NG-EOP T007.03
Steel Structure Foundation/Footer Inspection and Repair	20 Years ²	20 Years ²	NG-EOP T007.04
Wood Pole Inspection and Treatment	10 Years ³	10 Years ^{2 3}	NG-EOP T007.05
Steel Structure Painting	20 Years ²	20 Years ^{2 4}	NG-EOP T007.06
Inspection of Aircraft Warning Lights	N/A	Twice/Week	NG-EOP T007.07
Switch Inspection	As Needed	As Needed	NG-EOP T007.08
Comprehensive Inspection	As Needed	As Needed	NG-EOP T007.09
Documentation	As Needed	As Needed	NG-EOP T007.10

¹ 6 months for some NY circuits – see EOP T007.02 for specifics.

² This schedule is a guideline and may be adjusted by Asset Management or Operations.

³ 5 Years for poles not receiving full treatment due to access issues or poles near bodies of water

⁴ 10 years for some NY circuits – see EOP T007.06 for specifics.

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Table 2



Sub-Transmission System			
Maintenance Inspection	Inspection Interval		NG - Electric Operating Procedure
	NE	NY	
Ground Level Visual Inspection	5 Years	5 Years	NG-EOP T007.01
Aerial Visual Inspection	1 Year	1 Year	NG-EOP T007.02
Electrical Connector Inspection and Maintenance (Infrared Inspection)	3 Year	3 Year	NG-EOP T007.03
Steel Structure Foundation/Footer Inspection and Repair	20 Years ¹	20 Years ¹	NG-EOP T007.04
Wood Pole Inspection and Treatment	N/A	N/A	NG-EOP T007.05
Steel Structure Painting	20 Years ¹	20 Years ¹	NG-EOP T007.06
Inspection of Aircraft Warning Lights	N/A	N/A	NG-EOP T007.07
Switch Inspection (visual)	As Needed	As Needed	NG-EOP T007.08
Comprehensive Inspection	As Needed	As Needed	NG-EOP T007.09
Documentation	As Needed	As Needed	NG-EOP T007.10

¹ The schedule for these activities is a guideline and may be adjusted by Asset Management or Operations as necessary.

This document applies to all workers whose duties or work assignments require them to perform inspection, maintenance and repair activities on National Grid Sub-Transmission and Transmission assets. It is expected that these procedures will be executed by Qualified Personnel as determined by training specific to the task performed.

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PURPOSE

This procedure outlines the requirements for Line Inspection and Maintenance activities on National Grid Transmission and Sub-Transmission assets.

ACCOUNTABILITY

Specific planned work performed under this procedure will be coordinated by following work groups via a work plan document to be released prior to the start of each fiscal year:

- 1 T&D Work Methods
 - A Update procedure as necessary
- 2 Project Management & Complex Construction / Electric Operations
 - A Ensure that this procedure is understood and implemented
 - B Ensure that all personal are trained in this procedure
 - C Repair problems found during inspections according to follow-up prioritization criteria
- 3 T&D Maintenance / Electric Operations / Inspections
 - A Schedule and coordinate inspections for transmission and sub-transmission assets
 - B Ensure inspections as outlined in the fiscal year work plan are safely and properly executed
 - C Ensure worker understanding and comprehension of the requirements of this EOP
- 4 Employee
 - A Demonstrate the understanding of this procedure
 - B Comply with the requirements of this procedure

COORDINATION

National Grid Project Management & Complex Construction
 T&D Maintenance
 Electric Operations
 Inspections

REFERENCES

NY PSC Order 04-M-0159
 NY PSC Order Adopting Changes to Electric Safety Standard, December 2008
 MA General Law #220 CMR 125 Section 20
 NG-EOP G016 Elevated Equipment Voltage Testing
 NG-EOP T007.01 thru T007.10
 National Grid Employee Safety Handbook

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DEFINITIONS

Assets: Transmission or Sub-Transmission line facilities and equipment

Inspection: A careful viewing of assets to find defects and other problems that require maintenance or monitoring

Inspection and Maintenance Program: Planned program for inspecting and maintaining Transmission and Sub-Transmission lines

Inspector: Qualified personnel who identify defects via a specific type of inspection.

Maintenance: Work to correct defects or other problems, often generated through the Inspection process

Maintenance Management System (MMS): A computer application that schedules and tracks inspections and/or maintenance work

Qualified Personnel: Personnel trained to safely perform a specific inspection

Transmission Line GIS Software: Software referencing the helicopter's position, including the structure number, line name, latitude and longitude

Work Plan: A document published each fiscal year listing all inspection and maintenance scheduled for the year

TRAINING

Provided by L&D upon request by user department

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1.0 GROUND LEVEL VISUAL INSPECTION

- 1.1 Conducted by a qualified inspector
 - 1.1.1 Identify hazards, deficiencies or non-standard construction on National Grid Transmission and Sub-Transmission Assets.
 - 1.1.2 Scheduled per Tables 1 and 2 above.
 - 1.1.3 New facilities added incorporated through the transmission line GIS software and added to the appropriate inspection cycle.
 - 1.2 Consists of a visual inspection identifying all required maintenance on a Windows® based hand held computer.
 - 1.3 Inspection includes, but is not limited to, condition / rating of:
 - 1.3.1 Steel
 - 1.3.2 Foundation
 - 1.3.3 Pole/Tower
 - 1.3.4 Crossarm
 - 1.3.5 Anchor/Guy
 - 1.3.6 Structure/Pole Numbering
 - 1.3.7 Conductor
 - 1.3.8 Hardware
 - 1.3.9 Right of Way
 - 1.3.10 Vegetation
 - 1.3.11 GIS Record Accuracy
 - 1.4 Maintenance items identified are separated into 4 priority levels.
 - 1.4.1 Problem codes default to the appropriate priority level in the MMS.
 - 1.4.2 Default priority level can be adjusted by the inspector based on actual field conditions.
 - 1.4.3 Priority levels:
 - a. Level 1 – Address within 7 total days
 - 1. Begins the day after the problem is discovered
 - b. Level 2 * – Address within 1 year from date entered into database
 - c. Level 3 * – Address within 3 years from date entered into database
 - d. Level 4 – Monitor condition or use for studies
- * Unless a Project to address the defects is imminent

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1.5 Refer to NG-EOP T007.01



2.0 AERIAL VISUAL INSPECTION

- 2.1 Performed by qualified inspectors
- 2.2 Identify hazards, deficiencies or non-standard construction
- 2.3 Scheduled per Tables 1 and 2 above
- 2.4 New facilities incorporated through the Transmission Line GIS Software and added to the appropriate inspection cycle
- 2.5 Inspection includes, but is not limited to:
 - 2.5.1 Broken or flashed insulators
 - 2.5.2 Leaning structures
 - 2.5.3 Broken hardware
 - 2.5.4 Tree conditions
 - 2.5.5 ROW problems
 - 2.5.6 Conductor clearance violations
 - 2.5.7 Any other item which might affect the operation, reliability or safety of the general public
- 2.6 Refer to NG-EOP T007.02

3.0 ELECTRICAL CONNECTOR INSPECTION AND MAINTENANCE (INFRARED INSPECTION)

- 3.1 Performed by qualified infrared camera operator
 - 3.1.1 Typically an aerial view
- 3.2 Identify connectors operating at elevated temperatures
- 3.3 Scheduled per Tables 1 and 2 above
- 3.4 Refer to NG-EOP T007.03

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4.0 STEEL STRUCTURE FOUNDATION/FOOTER INSPECTION AND REPAIR

- 4.1 Performed by a qualified inspector
- 4.2 Identify foundation / footer deficiencies
 - 4.2.1 Including but not limited to:
 - a. Excavating the tower footing
 - 1. Minimum of 24" below grade
 - b. Cleaning the footer
 - c. Visual inspection
 - d. Steel or concrete repair
 - 1. If required
 - e. Application of a protective coating
 - f. Backfill and compact soil
- 4.3 Scheduled per Tables 1 and 2 above
- 4.4 Refer to NG-EOP T007.04

5.0 WOOD POLE INSPECTION AND TREATMENT

- 5.1 Performed by a qualified inspector
- 5.2 Identify ground line issues with poles
 - 5.2.1 Including but not limited to:
 - a. Excavating 18" below grade
 - b. Shaving/removal of decayed wood
 - c. Measuring the circumference
 - d. Drilling
 - e. Measurements for voids
 - f. Evaluation of pole strength
 - 1. Per NESC requirements
 - g. Treat with preservatives
 - h. Plug drilled holes
 - i. Backfill and compact soil
- 5.3 Visually inspect remainder of pole

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5.4 Scheduled per Tables 1 and 2 above

5.5 Refer to NG-EOP T007.05

6.0 STEEL STRUCTURE PAINTING

6.1 Performed by a qualified painter

6.1.1 Including line worker qualification as required

6.2 Application of a protective coating system

6.3 Scheduled per Tables 1 and 2 above

6.3.1 Some structures have shorter intervals to meet specific

a. FAA aerial marking requirements

b. NYPSC permit requirements

6.4 Refer to NG-EOP T007.06

7.0 INSPECTION OF AIRCRAFT WARNING LIGHTS

7.1 Performed by a qualified inspector

7.2 Required on tower lights without automatic monitoring

7.3 To meet FAA requirements

7.3.1 FAA Advisory Circular AC 70/7460-1K CHG 1

a. Automatic or periodic visual monitoring required

7.4 Inspect lights twice weekly:

7.4.1 Day and night lighting:

a. Once per week during the day

b. Once per week at night

7.4.2 Night lighting only

a. Twice per week at night

7.5 All malfunctions or abnormalities shall be reported immediately to the Network Control Center (NCC) at (315) 460-2600

7.6 Refer to NG-EOP T007.07

8.0 SWITCH INSPECTION

8.1 Performed by a qualified inspector or Lineworker

8.2 All manual switches including air break and load break

8.2.1 Four types of inspection

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- a. Visual Inspection
 - 1. In conjunction EOP T007.01
 - 2. Identify major defects such as
 - i. Chipped / broken insulators
 - ii. Tracking
 - iii. Misalignment
 - iv. Damaged or missing components
- b. Operational Inspection
 - 1. In conjunction EOP T007.01
 - 2. Perform visual inspection in 8.2.2 a above
 - 3. Thermograph the connections
 - 4. Operate the switch
 - i. Identify any issues during operation
 - 5. Repeat thermography
- c. Diagnostic Inspection
 - 1. Perform visual inspection in 8.2.2 a above
 - 2. Perform minor maintenance
 - i. Lubrication
 - 3. De-energization and grounding of the switch required
- d. Acceptance Inspection
 - 1. Performed at installation
 - 2. Inspection of all components of the switch
 - 3. Electrical testing utilizing test equipment

8.3 Refer to NG-EOP T007.08

9.0 COMPREHENSIVE INSPECTION

9.1 Comprehensive inspections

9.1.1 Are conducted on an as-needed basis to identify

- a. Specific problems
- b. Reliability issues
- c. To determine condition for planned rebuilds or upgrades

9.1.2 Are detailed inspections beyond

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- a. The ground level visual inspection
 - b. The aerial visual inspection
- 9.1.3 Are generally performed using a helicopter
 - a. May also be accomplished using
 - 1. Aerial devices
 - 2. Foot patrols with
 - i. High powered binoculars
 - ii. High resolution cameras
 - 3. Workers physically climbing the structure

9.2 Refer to NG-EOP T007.09

10.0 DOCUMENTATION

- 10.1 Inspections required by this EOP shall be documented on appropriate forms
 - 10.1.1 See the appropriate section for report frequency
- 10.2 Submit completed forms to National Grid management
- 10.3 Refer to NG-EOP T007.01 through T007.10

<u>Version</u>	<u>Date</u>	<u>Description of Revision</u>
1.0	06/01/15	Complete re-write of existing SP 06.01.601.000 (Infonet listed as SP 06.01.601) dated 4/18/11 and EOP T007 dated 8/18/09; break document into separate parts for each type of Inspection or Maintenance; include documents previously maintained by Transmission Maintenance; update department names, put into outline format, point to the individual EOP for details

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