Revisions to this document shall be communicated in accordance with program document AM-EU-P034 to ensure alignment between Maintenance Templates and field work procedures.

Surge Arresters - Free Standing and Installed on Transformer ≥ 69kV

Component Classification Categories							
Criticality	I	X					Free Standing Arrestors and Arrestors installed on Transformers at Nuclear Switchyards ≥220 kV as defined in the respective Nuclear Plant Interface Requirements (NPIRs)
	II		X				Free Standing Arrestors and Arrestors installed on Transformers rated ≥9,375kVA at DC, SS, TDC, TSS locations that serve O'Hare & Midway Airports
	III			X			Free Standing Arrestors at: ▪ Next Terminal Out [Equipment 220kV & Up] from Nuclear Switchyards (as defined in the respective NPIRs) ▪ Critical Transmission Interconnections ▪ Critical Equipment / Locations per AM-CE-P034-R0001 Arrestors installed on Transformers rated ≥9,375kVA at locations exclusive of Criticality I and II locations
	IV				X		All other applications
Duty Cycle	Heavy Load	N/A	N/A	N/A	N/A		
	Normal Load	N/A	N/A	N/A	N/A		
Service Condition	In Service	X	X	X	X		
	Spare	N/A	N/A	N/A	N/A		

Condition Monitoring Tasks	**Task Frequencies**				**Failure Codes**	**Comments**
Thermography	**1Y**	**1Y**	**1Y**	**1Y**	**3a**	
Power Factor Test	**8Y**	**8Y**	**8Y**	**AR**	**1a, 2c-e**	
Time Directed	**Task Frequencies**				**Failure Codes**	**Comments**
None	**N/A**	**N/A**	**N/A**	**N/A**		
Failure Finding Tasks	**Task Frequencies**				**Failure Codes**	**Comments**
Visual Inspection	**5W**	**5W**	**10W**	**10W**	**2a-b**	
Detailed Visual Inspection	**8Y**	**8Y**	**8Y**	**AR**	**2a-b, 2f**	
Condition Directed Tasks	**Task Frequencies**				**Failure Codes**	**Comments**
None	**N/A**	**N/A**	**N/A**	**N/A**		

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Surge Arrester - Installed on Transformer ≤34kV									
Component Classification Categories									
Criticality	I	X							Transformers rated ≥9,375kVA at DC, SS, TDC, TSS locations that serve O'Hare & Midway Airports
	II		X						Transformers rated ≥9,375kVA at ComEd locations exclusive of ≤34kV ESS, DCs and Criticality I locations
	III			X					Transformers rated ≥9,375kVA at DC locations
	IV				X				Transformers rated ≥9,375kVA at ≤34kV ESS locations
	V					X			Transformers rated >2,500kVA and <9,375kVA at DC, SS, TDC, TSS locations that serve O'Hare & Midway Airports
	VI						X		Transformers rated >2,500kVA and <9,375kVA at Critical Equipment / Locations per AM-CE-P034-R0001
Duty Cycle	Heavy Load	N/A	N/A	N/A	N/A	N/A	N/A		
	Normal Load	N/A	N/A	N/A	N/A	N/A	N/A		
Service Condition	In Service	X	X	X	X	X	X		
	Spare	N/A	N/A	N/A	N/A	N/A	N/A		
Condition Monitoring Tasks		**Task Frequencies**						**Failure Codes**	**Comments**
Thermography		**1Y**	**1Y**	**1Y**	**1Y**	**1Y**	**1Y**	**3a**	
Power Factor Test		**8Y**	**8Y**	**8Y**	**8Y**	**16Y**	**16Y**	**1a, 2c-e**	
Time Directed		**Task Frequencies**						**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		
Failure Finding Tasks		**Task Frequencies**						**Failure Codes**	**Comments**
Visual Inspection		**5W**	**10W**	**3M**	**6M**	**5W**	**10W**	**2a-b**	
Detailed Visual Inspection		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**2a-b, 2f**	
Condition Directed Tasks		**Task Frequencies**						**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		

Revisions to this document shall be communicated in accordance with program document AM-EU-P034 to ensure alignment between Maintenance Templates and field work procedures.

Surge Arrester - Free Standing ≤34kV NOT Installed on Transformer							
Component Classification Categories							
Criticality	I	X					DC, SS, TDC, TSS locations that serve O'Hare & Midway Airports
	II		X				Locations exclusive of ESS ≤ 34 kV, DCs and Criticality I locations
	III			X			DC locations
	IV				X		≤34 kV ESS locations
Duty Cycle	Heavy Load	N/A	N/A	N/A	N/A		
	Normal Load	N/A	N/A	N/A	N/A		
Service Condition	In Service	X	X	X	X		
	Spare	N/A	N/A	N/A	N/A		
Condition Monitoring Tasks		**Task Frequencies**				**Failure Codes**	**Comments**
Thermography		**1Y**	**1Y**	**1Y**	**4Y**	**3a**	
Power Factor Test		**N/A**	**N/A**	**N/A**	**N/A**	**1a, 2c-e**	
Time Directed		**Task Frequencies**				**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**		
Failure Finding Tasks		**Task Frequencies**				**Failure Codes**	**Comments**
Visual Inspection		**5W**	**10W**	**3M**	**6M**	**2a-b**	
Detailed Visual Inspection		**N/A**	**N/A**	**N/A**	**N/A**	**2a-b, 2f**	
Condition Directed Tasks		**Task Frequencies**				**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**		

SURGE ARRESTER FAILURE MODES

FAILURE MODE	FAILURE CAUSES	MAINTENANCE TASKS
1. Fails to Absorb High Voltage Impulse	1a. Abnormal Internal Resistance	Power Factor Test
2. Fails to Provide Adequate Insulation Level	2a. External Contamination	Visual Inspection
2. Fails to Provide Adequate Insulation Level	2a. External Contamination	Detailed Visual Inspection
2. Fails to Provide Adequate Insulation Level	2b. Cracked/Broken Porcelain	Visual Inspection
2. Fails to Provide Adequate Insulation Level	2b. Cracked/Broken Porcelain	Detailed Visual Inspection
2. Fails to Provide Adequate Insulation Level	2c. Voltage Grading Circuit Degradation	Power Factor Test
2. Fails to Provide Adequate Insulation Level	2d. Arch Gap Circuit Degradation	Power Factor Test
2. Fails to Provide Adequate Insulation Level	2e. Internal Contamination	Power Factor Test
2. Fails to Provide Adequate Insulation Level	2f. Cracked/Broken Seals	Detailed Visual Inspection
3. Fails to Provide Current Path	3a. High Resistance Connection	Thermography

SURGE ARRESTER MAINTENANCE TASK DEFINITION

TASK	DEFINITION
Detailed Visual Inspection	Detailed visual inspection performed with equipment de-energized. Items to be checked / completed include: -- Porcelain should be free of contamination - wipe down if required -- Inspect for chips or cracks in porcelain -- Check for loose hardware and connections -- Expulsion ports
Power Factor Test	Electrical test that usually performed using a doble test set.
Thermography	Infrared inspection of electrical equipment and power path components to identify any hot spots that may exist. The inspection scope includes: -- Surge arrestor -- Primary and secondary connections
Visual Inspection	Visual assessment of the condition of the equipment. Scope includes: -- Check for unusual noises and smells -- Check for chips or cracks in porcelain -- Expulsion ports -- Ground connections -- Loose hardware -- Cracked cement -- Surface contamination

SURGE ARRESTER MAINTENANCE BASIS

Surge Arrester Template Summary

The Preventive Maintenance program is documented via maintenance templates. Templates have been developed that address transmission, substation, and distribution equipment that is owned and maintained by Exelon Utilities. Each template documents the program tasks, frequencies, failure modes, and maintenance basis for the associated equipment. Tasks and associated frequencies are designed to address known failure modes of the equipment covered by the template. In general, the tasks included in the maintenance templates are the result of good industry practices, industry experience, and manufacturer recommendations.

References:
Doble Engineering "Arrester Field-Test Guide", Fifth Edition, June 1996

Boundary Definition
The boundary of a surge arrester for the purpose of this document is defined to include the surge arrester and the primary and ground connections.
Excluded from this treatment are: The structure and foundation.

Failure Experiences
Failures are subject to ACE/RCI investigation. Findings/recommended corrective actions are incorporated into the template as required.

Vendor Recommendations
Vendor documentation was reviewed during development of this template

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Disposition of Vendor Recommendations
Recommendations were incorporated into the template as deemed necessary.

Basis for Template Tasks

Detailed Visual Inspection: This inspection is performed on de-energized equipment and allows for more in depth evaluation of the components than when the equipment is in an energized state.

SURGE ARRESTER MAINTENANCE BASIS

Power Factor Test: Provides an indication of the condition of arrester housing and elements with regard to moisture, foreign deposits, corrosion, broken resistor, punctured disks, etc. This test is best used for trending purposes.

Thermography: A primary tool for detection of hot spots which may be indicative of connection issues.

Visual Inspection: This inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions.

SURGE ARRESTER TEMPLATE DEVELOPMENT HISTORY

	Revision 0	Date 06/17/2005
Writer	Drew Reindel (Strategic Programs)	
Reviewer(s)	August 2004 EED / Nuclear Challenge Session Attendees	
Approver(s)	Kathy McHugh (FAM Maintenance Planning)	
Reason Written	To document the maintenance program tasks, frequencies, failure modes, and maintenance basis	

	Revision 1	Date 11/17/2006
Writer	Drew Reindel (Strategic Programs)	
Reviewer(s)		
Approver(s)	Kathy McHugh (FAM Maintenance Planning)	
Reason Written	General scrub, task and periodicity review/update	

	Revision 2	Date 11/30/2010
Writer	Chris Stefanski	
Reviewer(s)	Ken Wendt (Mgr. Material Condition), Drew Reindel (Mgr. T&S Enginering)	
Approver(s)	Bill Fluhler , Bill Gannon, Nitin Patel, Jim Crane, Bill Sullivan	
Reason Written	Added note to ensure template changes are communicated to affected work groups.	

	Revision 3	Date 04/29/2011
Writer	Chris Stefanski (Material Condition)	
Reviewer(s)	Ken Wendt, Drew Reindel, Jim Crane	
Approver(s)	Bill Fluhler (ComEd) , Bill Sullivan (PECO)	
Reason Written	Modified criticality definitions and incorporated 10-week, 3-month and 6-month inspection task frequencies. Created separate tabs by voltage and application.	

SURGE ARRESTER TEMPLATE DEVELOPMENT HISTORY

	Revision EU 0	**Date 12/14/2012**
Writer	Chris Stefanski (Material Condition)	
Reviewer(s)	Ken Wendt, Drew Reindel, Jim Crane	
Approver(s)	Bill Fluhler (UFAM ComEd) , J. Coffman (UFAM PECO), Chris Lotz (UFAM BGE)	
Reason Written	Changed document number and document template to align with Exelon Utilities Management Model. Modified criticality definitions for ComEd to show that, outside nuclear switchyards, application is limited to transformers.	

	Revision EU 1	**Date 06/12/2014**
Writer	Steven Scalcucci (Material Condition)	
Reviewer(s)	Ken Wendt, George Leinhauser	
Approver(s)	Mike Moy (UFAM ComEd) , J. Coffman(UFAM PECO), Chris Lotz (UFAM BGE)	
Reason Written	Changed equipment description to include the term "Free Standing", PF and Details Visual to 8Y for ≥ 69kV.	

	Revision EU 2	**Date 07/21/2014**
Writer	Chris Stefanski (Exelon Utilities)	
Reviewer(s)	Ken Wendt, George Leinhauser, Tom Harrington, Ed Carmen	
Approver(s)	Mike Moy (UFAM ComEd) , J. Coffman(UFAM PECO), Cory Summerson (UFAM BGE)	
Reason Written	Changed applicability note regarding BGE maintenance programs. Changed criticality definition to include applicability to BGE - Calvert Cliffs nuclear switchyard.	

	Revision CE 0	**Date 02/06/2015**
Writer	Chris Stefanski (Exelon Utilities)	
Reviewer(s)	Ken Wendt, Greg Hitzke, Tu Liang	
Approver(s)	Michael Moy (UFAM ComEd)	
Reason Written	Created to document the ComEd maintenance program tasks, frequencies, failure modes, and maintenance basis.	

	Revision CE 1	**Date 10/27/2017**
Writer	Hugo Castaneda (ComEd Material Condition)	

SURGE ARRESTER TEMPLATE DEVELOPMENT HISTORY

Reviewer(s)	Greg Hitzke (ComEd), Tu Liang (ComEd), Dale Player (ComEd), Nitin Patel (ComEd), Rich Bellino (ComEd), Betsy Spolarich (ComEd), Ismael Rivera Jr (Dresden Nuclear Station Systems Engineer), Travis Greene (Byron Nuclear Station Systems Engineer), Sachin Shukla (Braidwood Nuclear Station Systems Engineer), Aaron Kulow (Quad Cities Nuclear Station Systems Engineer), Kent Nelson (LaSalle Nuclear Station Systems Engineer)
Approver(s)	Michael Moy (UFAM ComEd)
Reason Written	Revised to include new criticalities as defined in AM-CE-P034-R0001 and adjust Transformer ratings accordingly to reflect testing range for Power Transformers.