ON LINE MONITORING EQUIPMENT - TRANSFORMERS
MAINTENANCE TEMPLATE

AM-CE-P034-R1048
Rev. 1

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.

On Line Monitoring System - Transformers								
Component Classification Categories								
Criticality	I	X						Nuclear switchyards ≥ 220 kV as defined in the respective Nuclear Plant Interface Requirements (NPIRs)
	II		X					DC, SS, TDC, TSS locations that serve O'Hare & Midway Airports
	III			X				ComEd locations exclusive of Criticality I & II, DC, and≤34 kV ESS locations
	IV				X			DC locations
	V					X		≤ 34 kV ESS locations
Duty Cycle	Heavy Load	N/A	N/A	N/A	N/A	N/A		
	Normal load	N/A	N/A	N/A	N/A	N/A		
Service Condition	In-Service	X	X	X	X	X		
	Spare	N/A	N/A	N/A	N/A	N/A		
Condition Monitoring Tasks		**Task Frequencies**					**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		
Time Directed Tasks		**Task Frequencies**					**Failure Codes**	**Comments**
Replace calibration and carrier gas cylinders - Calisto C501 only		**AR**	**4Y**	**4Y**	**4Y**	**4Y**	**3a**	
Replace calibration and carrier gas cylinders - All other Monitors		**AR**	**2Y**	**2Y**	**2Y**	**2Y**	**3a**	Where Calisto chromatograph type, multi-gas analyzers are installed. For other chromatograph type, multi-gas analyzers, cylinders are replaced As Required per manufacturer's instructions.
Failure Finding		**Task Frequencies**					**Failure Codes**	**Comments**
Visual Inspection		**5W**	**5W**	**10W**	**3M**	**6M**	**1a-b, 2a**	Applicable only to devices without SCADA error alarms
Condition Directed Tasks		**Task Frequencies**					**Failure Codes**	**Comments**
None		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		

REAL TIME ON LINE MONITORING EQUIPMENT
FAILURE MODES

FAILURE MODE	FAILURE CAUSES	MAINTENANCE TASKS
1. Water Intrusion	1a. Housing O-Ring	Visual Inspection
1. Water Intrusion	1b. Cabinet Door Gasket	Visual Inspection
2. Circuit Failure	2a. Water Intrusion	Visual Inspection
3. Inaccurate Readings	3a. Lack of reference or carrier gas	Replace calibration and carrier gas cylinders

REAL TIME ON LINE MONITORING EQUIPMENT
MAINTENANCE TASK DEFINITION

TASK	DEFINITION
Visual Inspection	Visual assessment of the condition of the equipment. Provides indication of the external physical condition of the monitor. Check O-rings, door gaskets, loose hardware, cabinet condition, error alarms on display (if applicable), etc.
Replace calibration and carrier gas cylinders	Proactively replace both gas cyclinders before the reference and carrier gas cylinders are depleted. Follow Manufacturer's instructions on replacement frequency.

REAL TIME ON LINE MONITORING EQUIPMENT
MAINTENANCE BASIS

Real Time On Line Monitoring Equipment 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:
Internal reports and operating experience
IEEE C57.143-2012 Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components

Boundary Definition
The boundary of an on-line monitoring system for the purpose of this document is defined to include the monitoring RTU and its enclosure (if separate from the control cabinet), the Dissolved gas and Moisture Monitor and the reference and carrier gas cylinders and associated enclosures. Also included are any other IEDs, transducers, sensors and devices providing inputs into the RTU.

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

Vendor Recommendations
Manufacturer's manuals

Disposition of Vendor Recommendations
N/A

Basis For Template Tasks

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. Monitoring System self-diagnosing error alarms will indicate a trouble with the monitoring system's functionality.

Replace calibration and carrier gas cylinders: The analyzer uses calibration gas to establish an internal reference. Helium gas is used as a carrier to perform the gas-in -oil diagnostics. Useful life of either cylinder is based on manufacturer's design, usage and recommendation for replacement.

REAL TIME ON LINE MONITORING EQUIPMENT
TEMPLATE DEVELOPMENT HISTORY

	Revision 0	**Date 08/06/2015**
Writer	Hugo Castaneda (Material Condition)	
Reviewer(s)	Ken Wendt, Jenn Khong	
Approver(s)	Mike Moy (UFAM ComEd)	
Reason Written	Created document to serve as the ComEd maintenance standard.	

	Revision 1	**Date 06/29/2018**
Writer	Kevin Swiat (Material Condition)	
Reviewer(s)	Greg Voice (T&S Equipment Standards)	
Approver(s)	Michael Moy (ComEd UFAM)	
Reason Written	Revised criticalities to align with AM-CE-P034-R0001; Clarified Time Directed Tasks for Calisto C501 monitors; Completed 3 Year Review.	