Procedure Contains NMM REFLIB Forms: YES ☐ NO ☒

Effective Date	Procedure Owner: Title: Site:	James P. Miksa Mgr, Program&Comp. PLP	Governance Owner: Title: Site:	Oscar Limpias VP Engineering HQN
3/1/2010				

Exception Date*	Site	Site Procedure Champion	Title
	ANO	Robert Beaird	Manager, P & C, Acting
N/A	BRP		
	GGNS	Matthew Rohrer	Manager, Programs & Components
	IPEC	Richard Burroni	Manager, Programs & Components
	JAF	Patrick Scanlan	Manager, Programs & Components
	PLP	James P. Miksa	Manager, Programs & Components
	PNPS	Steven Woods	Manager, Programs & Components
	RBS	Chris Forpahl	Manager, Programs & Components
	VY	George Wierzbowski	Manager, Programs & Components
	W3	Rex Putnam	Manager, Programs & Components
N/A	NP		
	HQN	Luis Terrazas	Manager, P & C, Acting

Site and NMM Procedures Canceled or Superseded By This Revision

Process Applicability Exclusion: All Sites: ☐
Specific Sites: ANO ☐ BRP ☐ GGNS ☐ IPEC ☐ JAF ☐ PLP ☒ PNPS ☐ RBS ☐ VY ☐ W3 ☐ NP ☐

Change Statement

Revision 3 is being issued to incorporate procedural enhancements Revision 3 is being issued to incorporate process enhancements resulting from programmatic weaknesses identified at ANO-2. Reference CR-ANO-2-2009-319
Changes to Section 1, [1], [2], [3] and [5] provide clarification and further define the Purpose statements.
Change to Section 2, [3] was the removal of Reference [3] to Section 6, Interfaces [10]
Change to Section 2, [18] updates the procedure to the latest FAC Qualification Card
Change to Section 2.2, [1] and [2] added a Site Specific Reference section to this procedure
Change to Section 3, adds [3] CHECWORKS Software definition
Change to Sections 3.0 [19] editorial
Change to Sections 4.1 [3] and 4.2 [1], [9] and [12] editorial
Changes to Section 4.4 [1] thru [5], [7] thru [10], [13], [16], [24], [26] and [27] editorial clarification
Changes to Section 4.6 [1], [2] and [4] provides editorial clarification
Changes to Sections 5.2 [1] thru [5] and [7] provides enhanced guidance to the Analysis/Pre-examination process
Changes to Section 5.3 [4] editorial
Change to Section 5.6 Added Note to this Section that specifies personnel qualification requirements.
Change to Section 5.6 [2] provides enhanced guidance to screen criteria
Change to Section 5.6 [1] provides additional guidance and criteria for FAC maintenance and update
Change to Section 5.6 [3] thru [11] editorial
Change to Section 6.0 [9] adds NSAC 202L as an Interface document

*Requires justification for the exception:

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1.0 PURPOSE

[P-33641 - P-33643], [P-33645], [P-33714 – P-33719], [P-33730], [P-35351], [JAFP-87-0737], [JPN-89-051], [IP3-87-055Z], [IPN-89-044], [BECo-89-107], [FVY-89-66], [FVY-87-94], [FVY-87-121], [P-1079], [P-35269], [P-24444], [P-15802], [P-15803], [P-16557], [P-20303], [P-22888], [RCL 01038934-01], [CMT891015777]

[1] The purpose of this procedure is to implement a common approach to establish programmatic control, updating, and documenting Flow-Accelerated Corrosion (FAC) programs for standardization at Entergy's nuclear plants.

[2] The objective of the FAC program is to predict, detect, monitor and minimize degradation in single and two-phase flow piping (safety and non-safety related systems) to prevent failures while enhancing plant safety and reliability.

[3] This procedure provides criteria and methodology for selecting components for inspection, performing inspections, evaluating inspection data and disposition of results, sample expansion requirements, piping repair /replacement criteria, program responsibilities and documentation requirements.

[4] This procedure may be used as a guide for evaluating systems and components that are not included in the FAC program.

[5] The frequency of the activities described in this document shall be on a refuel outage basis, unless otherwise noted. However, in some cases, online or mid-cycle inspection and evaluation may be performed.

2.0 REFERENCES

2.1 General References

[1] NRC Generic Letter 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning".

[2] NUREG-1344, "Erosion/Corrosion-Induced Pipe Wall Thinning in U.S. Nuclear Power Plants."

[3] EPRI Technical Report, TR-106611, "Flow-Accelerated Corrosion in Power Plants"

[4] NRC Bulletin No. 87-01, "Pipe Wall Thinning."

[5] Erosion/Corrosion in Nuclear Power Plant Steam Piping: Causes and inspection Program Guidelines. EPRI, April 1985. NP-3944.

2.0 cont.

[6] ANSI B31.1 “Power Piping”, (For applicable code year see individual plant FSAR).

[7] EPRI Paper, "Single-Phase Erosion/Corrosion of Carbon Steel Piping", February 1987.

[8] EPRI Paper - "Practical Consideration for the Repair of Piping Systems Damaged by Erosion/Corrosion", dated 10/5/87

[9] Acceptance Criteria for Structural Evaluation of Erosion/Corrosion Thinning in Carbon Steel Piping. EPRI, April 1988. NP-5911.

[10] NRC Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repairs of ASME Code Class 1, 2 &3 Piping".

[11] INPO SOER 87-3, "Piping Failures in High-Energy Systems Due to Erosion/Corrosion", March 1987.

[12] INPO Significant Operating Experience Report (SOER) 82-11, "Erosion of Steam Piping and Resulting Failure", February 1982.

[13] IN 93-21, "Summary of NRC Staff Observations compiled during Engineering Audits on inspections of Licensee E/C Programs”, dated March 25, 1993.

[14] EPRI CHUG Position Paper #3, “A Summary of Tasks and Resources Required to Implement an Effective Flow Accelerated Corrosion Program.”

[15] EPRI CHUG Position Paper #4, ”Recommendations for inspecting Feedwater Heater Shells for Flow-Accelerated Corrosion Damage”, February 2000.

[16] CHECWORKS Steam /Feedwater Application, “Guidelines for Plant Modeling and Evaluation of Component Inspection Data”, EPRI No. 1009599, Final Report, September 2004.

[17] Entergy Quality Assurance Program Manual

[18] EN Common FAC Qualification Card FTK-ESPP-G00019, “Implementing the Flow Accelerated Corrosion Program“.

2.0 cont.

[19] CHECWORKS Steam /Feedwater Application, Version 2.1, EPRI No. 1009600, Final Report, October 2004.

[20] CHECWORKS Steam /Feedwater Application, latest version.

[21] Institute of Nuclear Plant Operations, "Engineering Program Guide, Flow Accelerated Corrosion", EPG-06

2.2 Site Specific References

[1] JAF-SPEC-MISC-03290 Rev.0, "Specification for Evaluation and Acceptance of Local Areas of material, parts and components that are less than the specified thickness." By REEDY Engineering.

[2] IP3-SPEC-UNSPEC-02996 Rev.0, "Specification for Evaluation and Acceptance of Local Areas of material, parts and components that are less than the specified thickness." By REEDY Engineering.

3.0 DEFINITIONS

[1] Base Line Inspection – An initial wall thickness measurement of a component taken prior to being placed in service.

[2] Basis Document - Program documents that define the scope, attributes, commitments, evaluation reports and predictive models that form the basis of the FAC program (i.e., System Susceptibility Evaluation reports). These documents contain the basis for the plant piping in the CHECWORKS model, the susceptible-not-modeled (SNM) piping and those that are non-susceptible.

[3] CHECWORKS – EPRI Computer Modeling Program used to predict rated wall thinning and remaining life of components degraded by FAC.

[4] Code Minimum Thickness (t_{min}, $t_{codemin}$) – The minimum required global wall thickness based on hoop stress.

[5] Critical Thickness (t_{crit}) - The minimum required wall thickness per code of construction required to meet all design-loading conditions.

[6] Deficient Component - A component identified by examination to be below t_{accpt} wall thickness or projected to be below t_{accpt} wall thickness by the next refueling outage.

3.0 cont.

[7] Degraded component – A component identified as being below the screening criteria that is acceptable for continued operation.

[8] EPRI CHUG – EPRI CHECWORKS USERS GROUP.

[9] Examination - Denotes the performance of all visual observation and nondestructive testing, such as radiography, ultrasonic, eddy current, liquid penetrant and magnetic particle methods.

[10] Examination Checklist/ Traveler – A data sheet/checklist developed for components being inspected and may contain but is not limited to the following: t_{nom}, t_{meas}, Tmin, Screening criteria, component's name, system number, previous data, inspection datasheet number, grid size, examination extent, work order and affiliated minimum wall calculation.

[11] Flow Accelerated Corrosion (FAC) - Degradation and consequent wall thinning of a component by a dissolution phenomenon, which is affected by variables such as temperature, steam quality, steam/fluid velocity, water chemistry, component material composition and component geometry. Previously known as Erosion/Corrosion.

[12] Grid - A pattern of points or lines on a piping component, where UT thickness measurements will be made. Grid may be permanently marked with circumferential and longitudinal grid lines.

[13] Grid Point – A specific location on a piping component, where a UT thickness measurement will be made. Grid points are at the intersections of the circumferential and longitudinal grid lines.

[14] Grid Point Reading – UT reading taken at the intersection of the grid location.

[15] Grid Scan – 100% scans of the area between the grid lines. The lowest measurement in each area is to be recorded as the measured thickness.

[16] Full Scan – scans of 100% of an area, circumference, nozzle, heater segments etc, measuring minimum, maximum and averages thicknesses and approximate location of minimum measured thickness.

[17] Grid Size - The distance between grid points in the circumferential or longitudinal direction. Also called grid space or grid spacing.

3.0 cont.

[18] Initial Thickness (t_{init}) - The thickness determined by ultrasonic examination prior to the component being placed into service (baseline) or the first ultrasonic examination during its service life. If an examination has not previously been performed on the component, the initial thickness shall be determined by reviewing the initial ultrasonic data for that component. The area of maximum wall thickness within the same region as the worn area (based on the method selected for evaluating wear) shall be identified and compared to t_{nom}. If the thickness is greater than t_{nom}, the maximum wall thickness within that region shall be used as t_{init}. If that thickness is less than t_{nom}, t_{nom} shall be used as t_{init}.

[19] Inspection Location - A specific examination location, which may be an elbow, tee, reducer, straight pipe section, etc.

[20] Inspection Outage - the outage during which the component was inspected.

[21] Large-bore Piping - Piping generally greater than 2" nominal pipe size with butt-weld fittings.

[22] Line Scans – piping segments broken into one-foot lengths (Small-Bore pipe).

[23] Minimum acceptable wall thickness (t_{accpt}) – Maximum value of axial stress, hoop stress, and/or critical thickness and the piping replacement values of 0.3 t_{nom} for Class1 piping or 0.2 t_{nom} for Class 2, Class 3 and non-safety related piping.

[24] Minimum Measured Thickness (t_{meas} or t_{mm}) - as identified by ultrasonic thickness examination, the present thickness at the thinnest point on a component.

[25] Local minimum required thickness (t_{aloc}) – Minimum acceptable local wall thickness as calculated by EN-CS-S-008-MULTI.

[26] Minimum required thickness (t^{a}_{min}) – Minimum required pipe wall thickness based on axial stress (See EN-CS-S-008-MULTI).

[27] Next Scheduled Inspection (NSI) -The outage at which an inspection will be performed on a given component.

[28] Nominal Thickness (t_{nom}) - Wall thickness equal to ANSI standard thickness.

3.0 cont.

[29] PASS 1 Analysis - Runs modeled in CHECWORKS that either have no inspection data, an insufficient number of inspections to provide a proper calibration, or where there is no expectation of ever developing a proper calibration.

[30] PASS 2 Analysis - The process of utilizing UT inspection data thickness measurements in CHECWORKS to predict wear and wear rates for components.

[31] Piping Segment - A run of piping that consists of inspection locations which have common operating parameters (i.e., temperature, pressure, flow rate, Oxygen content and pH level).

[32] Predicted /Projected Thickness (t_p, t_{pred}) -The calculated thickness of a component based upon a rate of wear to some point in time (e.g., next refueling, next scheduled examination).

[33] Quadrant Scan – Piping segments divided in quadrants A, B, C, D that are 90 degrees apart and broken into one-foot lengths, or as specified by the FAC engineer.

[34] Qualified FAC Engineer- Individual who has completed the FAC Qualification Card, who participates in the Engineering Support Personnel (ESP) training program and demonstrates knowledge required for the use of the CHECWORKS computer program.

[35] Reference Point - The point on a piping component where the longitudinal and circumferential grid lines originate.

[36] Remaining Service Life (RSL) - The amount of time remaining based upon an established rate of wear at which the component is anticipated to thin to t_{accpt}.

[37] Safety Factor – A Margin of Safety used to account for inaccuracies in wear rate evaluation.

[38] Sample Expansion - The addition of inspection locations based on significant or unexpected wall thinning during planned inspection(s).

3.0 cont.

[39] Significant wall thinning - Wall thinning to a thickness which is the largest of:

(a) a thickness less than 60% of pipe nominal wall thickness

(b) Wall thinning to a thickness that is half the remaining margin of the piping/ component which is above t_{accpt}. [½ (0.875 t_{nom} + t_{accpt})]

(c) (t_{accpt} + 0.020) inch.

[40] Small-bore Piping - Piping that is generally 2" or less nominal diameter and that typically uses socket welded fittings.

[41] Subsequent Inspection - Inspection of components that have had a baseline inspection and/or an initial operational inspection.

[42] Susceptible Line - Piping determined to be susceptible to FAC using the EPRI susceptibility criteria in NSAC 202L, industry experience and as documented in the System Susceptible Evaluation.

[43] Susceptible Non-Modeled (SNM) Piping - A subset of the FAC susceptible lines that cannot be modeled using the EPRI CHECWORKS software.

[44] Time - Time in service shall be actual hours on line or of operation and/ or hours critical. Calendar hours may be used for conservatism.

[45] Train – Loops within subsystems that have similar geometries, flow rates and temperatures and which have similar FAC risk.

[46] UT Datasheets - Paperwork that documents the results of the ultrasonic thickness inspections.

[47] Wear (W) - The amount of material removed or lost from a components wall thickness since baseline or subsequent to being placed in service.

[48] Wear Rate (WR) - Wall loss per unit time.

4.0 RESPONSIBILITIES

4.1 MANAGER, PROGRAMS & COMPONENTS ENGINEERING (SITE)

[1] Providing a single point of accountability and responsibility for the overall health and direction of the FAC programs.

[2] Ensuring that the FAC programs are effectively developed and implemented.

[3] Provides oversight for implementing the FAC programs.

[4] Co-ordinate ENN or ENS FAC Self-Assessments.

4.2 SUPERVISOR, CODE PROGRAMS (SITE)

[1] Designates responsible engineer/Personnel from the Code Programs Engineering Group for the implementation and maintenance of the Flow Accelerated Corrosion Program.

[2] Ensure that the Flow Accelerated Corrosion Program activities are conducted in accordance with this procedure.

[3] Shall ensure that repair procedures are in place to support any planned repairs or replacements.

[4] Ensure audits and surveillance of selected Flow Accelerated Corrosion (FAC) activities is performed to verify compliance with applicable codes, procedures and drawings.

[5] Provides personnel to perform NDE during normal plant operation and unscheduled outages.

[6] Shall provide qualified Non-Destructive Examination personnel to perform flow accelerated corrosion inspections during scheduled refueling and maintenance outages.

[7] Provides personnel to perform reviews of all final FAC UT data sheets.

[8] Provides personnel to review vendor procedures, personnel certifications and equipment certifications.

[9] Assures adequate technical personnel are available to provide required support services prior to the outage.

[10] Allocation of resources to execute the requirements of the program.

4.2 cont.

[11] Provide funding and resources to address control and configuration requirements for FAC drawings.

[12] Ensures the development of bench strength and back up personnel for the FAC program.

4.3 NDE LEVEL III OR DESIGNEE

[1] Reviews and approves FAC personnel and equipment certifications, and NDE procedures including revisions.

[2] NDE Level II or Level III reviews and signs all final NDE/UT data sheets to ensure appropriate NDE examinations have been completed in accordance with the FAC program. The NDE level III review of Risk Informed examination shall be performed in accordance with the site ISI program requirements.

[3] Resolution of anomalies found in inspection data.

[4] Identify discrepancies or deficiencies and initiates condition report in accordance with FAC program or site protocols as appropriate.

[5] Performs oversight of FAC examinations to verify vendor procedure compliance.

[6] Performs functions in accordance with applicable procedures including the Entergy Quality Assurance Program.

4.4 FLOW ACCELERATED CORROSION ENGINEER

[1] Implements and maintains an effective station FAC Program.

[2] Ensures all FAC Program work is performed in accordance with program procedural requirements.

[3] Prepares outage scope document prior to each outage using the criteria of this procedure, NSAC-202L, CHECWORKS (Pass 1 and Pass 2 output as a guide). Along with reviewing previous outage, inspection results and industry/site specific OE. This includes replacement scopes and initiation of paperwork as appropriate in support of replacements.

[4] Shall review FAC Program basis documents (SSE and SNM).

[5] Shall provide input to Planning for publishing schedules, work scopes, resource requirements and outage progress reports

4.4 cont

[6] Review and/or perform an engineering evaluation for all Flow Accelerated Corrosion inspections where pipe wall thinning has been identified and concur on any recommended action. Calculations shall be done in accordance with applicable procedures.

[7] Evaluates examination data and performs component evaluations to determine if components can remain in service.

[8] Ensures that appropriate inspections are performed in accordance with the scope of the Flow Accelerated Corrosion Program.

[9] Shall review all inspection data and make recommendations for repair/replacement of piping materials in accordance with site protocols, if applicable.

[10] Identifies examination sample expansion scope when required.

[11] Shall provide NDE data for review and signature to the ANII, if requested by the ANII.

[12] Shall provide Risk Informed Inspection data sheet (s) to the ANII for review and signature, if applicable.

[13] Shall ensure the Flow Accelerated Corrosion inspection program incorporates industry and in-house operating experiences and identifies, tracks and trends inspection results.

[14] Maintains records of all inspection results and inspection database.

[15] Develops a FAC examination checklist/traveler that contains t_{nom}, screening criteria, t_{accpt}, line number, etc. for the components being inspected.

[16] Initiates request for engineering services in accordance with the Asset Suite or site specific work control process for piping replacement or engineering evaluations as required. This request should include recommended materials for replacement and configuration changes, if applicable, to reduce the effects of flow accelerated corrosion.

[17] Shall periodically review completed plant modifications to assess their effect on the scope of the flow accelerated corrosion program.

[18] Shall assist in vendor oversight as required.

4.4 cont

[19] Maintain control of the predictive models (e.g. CHECWORKS), which includes any development, updates or revisions to the models.

[20] Developing, revising, and issuing FAC program documents.

[21] Initiating and/or responding to Condition Reports and Engineering Requests for evaluating degraded and deficient components or other discrepancies or deficiencies within the scope of the FAC program.

[22] Developing post outage inspection summary reports.

[23] Review and disposition Operating Event (OE) notices for applicability to the FAC program.

[24] Prioritizing and ranking inspection in terms of susceptibility and consequence of failure.

[25] Ensures key program elements are properly documented and program activities are controlled and performed in accordance with the applicable procedures.

[26] Maintains the System Susceptibility Evaluation and Small-Bore Non-Modeled Analysis reports.

4.5 DESIGN ENGINEERING/RESPONSIBLE ENGINEER

[1] Provide minimum acceptable wall thickness (t_{accpt}) to the FAC Engineer. Responsibility may be delegated to another department or qualified personnel.

[2] Perform local wall thinning evaluations for components having UT measurements that are below or are projected to go below the minimum acceptable wall thickness (t_{accpt}) or administrative wall thickness requirement. Responsibility may be delegated to another department or qualified personnel.

[3] Prepare and issue engineering response packages for component requiring replacement. Responsibility may be delegated to another department or qualified personnel.

[4] Perform remaining service life evaluation for components in the FAC program as required. Responsibility may be delegated to another department or qualified personnel.

4.6 MAINTENANCE SUPERVISOR/DESIGNEE

[1] The maintenance supervisor or designee will ensure that adequate craft personnel are available to support the FAC program. The supervisor shall ensure that scaffolding is erected, when needed, and insulation removal from components/piping segments scheduled for inspection and piping surface conditioning is performed prior to the scheduled inspection. Also ensures scaffolding erected in safety related areas is performed in accordance with applicable site procedures.

[2] The maintenance supervisor or designee shall notify the FAC engineer when an obstruction (i.e. support) requires removal for inspection, which may require an engineering evaluation.

[3] The maintenance supervisor must ensure that surfaces to be inspected are free from all foreign materials that would interfere with the inspections, i.e., dirt, rust, paint, etc. If cleaning is required, this may be accomplished by power sanding (flapper wheel only), hand wire brushing, or hand sanding in accordance with site procedures/protocols.

[4] The maintenance supervisor shall ensure restoration of lines, i.e. insulation replacement and scaffold removal, upon completion of the FAC inspection.

4.7 FAC/ISI PROJECT COORDINATOR

[1] A FAC/ISI project coordinator may be chosen to implement the activities of the inspection plan. The duties, if applicable, may include but are not limited to the following activities:

(a) Performing component walk downs

(b) Generating NDE inspection packages

(c) Defining NDE staffing as required

(d) Scheduling of inspections

(e) Acquiring data as required

(f) Providing field coordination to ensure timely inspections are accomplished

(g) Tracking progress of the FAC inspection project

(h) Transmitting inspection results to the FAC Engineer

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

None.

5.2 ANALYSIS/PRE-EXAMINATION

[1] Review Data and Update Program Elements

(a) Prior to selecting components for inspection, the FAC Program Engineer shall review the FAC program by the performing the following steps:

[2] Update Program Basis Document

(a) Review applicable information and ensure that the scope of the FAC Program as reflected in the Basis Document System Susceptibility Evaluation (SSE) is correct **AND** updated in accordance with Section 5.15 [5]. The review shall include items that could affect the FAC Program from the following sources, if applicable:

(1) Design Change Packages

(2) Maintenance Work Request History

(3) Station Chemistry Reports

(4) Station Thermography Report

(5) Station Corrective Action Database

(6) Maintenance Rule Classifications of FAC Systems

(7) Plant Personnel (e.g. Operations, System Engineers, Chemistry, Mechanical/Structural Engineering, Air Operated Valves (AOV), Motor Operated Valves (MOV) and Check Valve Groups)

[3] Review CHECWORKS Model

(a) **IF** any changes in plant operation, configuration, **OR** other factors that affect FAC that have occurred since the CHECWORKS model was last updated, **THEN** the model should be revised to reflect that change. As a minimum, the FAC Program Engineer should review the following items:

(1) Plant power levels

(2) Operating practices. **IF** the plant has operated in any off-normal condition (e.g. alternate system lineups), **THEN** update the model accordingly.

5.2[3](a) cont

(3) Plant chemistry. Ensure that the current conditions are represented in the model.

(4) Ensure that a Pass 2 analysis has been completed in accordance with the requirements provided in this document.

[4] Update Susceptible Non-Modeled (SNM) Program Document

(a) Based on the information identified in 5.2.2 **AND** any inspections of SNM components since the last revision, update of the Susceptible Non-Modeled Program shall be performed in accordance with Section 5.15 [5].

[5] Document Review

(a) The determination of updates, **IF** any, **AND** documenting reviews along with a peer review performed by a qualified FAC Engineer shall be captured in the FAC database, Outage Report **AND** the Program Notebook. **IF** a permanent change in the susceptibility status of a line is identified, **THEN** the Basis Document shall be revised to reflect that change.

[6] The criteria contained in NSAC-202L, latest revision, shall be used to perform the System Susceptibility Evaluation (SSE).

[7] The System Susceptibility Evaluation report shall be developed **AND** peer checked in accordance with Nuclear Maintenance Manual (NMM) procedures.

[8] Non-typical operation of systems should be taken into consideration **AND IF** necessary factored into the FAC program.

[9] The susceptible small-bore piping inspection priority ranking should consider personnel safety, consequence of failure **AND** plant unavailability.

[10] Industry **AND** plant experiences relating to FAC will be factored into the program.

[11] The CHECWORKS model should be used for guidance in determining inspection priority based on relative ranking for specific locations to be examined for FAC damage.

5.3 PREPARATION OF OUTAGE INSPECTION PLAN

[1] The FAC Program Engineer shall prepare an Outage Inspection Plan prior to the outage to meet site milestones.

5.3 cont

[2] The Outage Inspection Plan should consider the cost of repair/replacement versus inspection.

[3] The Outage Inspection Plan should consider inspection priority based on relative ranking for specific locations to be examined for FAC damage.

[4] Each identified location shall be documented in the inspection plan, along with the component number **AND** reason for selection **AND** basis for selection for inspection.

[5] The inspection plan shall be reviewed by qualified FAC personnel.

[6] Component Selection

(a) The FAC engineer shall prepare a FAC Outage Inspection scope as directed by plant milestones **OR** as directed by Station management.

(b) Inspection selections shall be made in accordance with the requirements of this procedure **AND** shall be identified based on CHECWORKS results, industry/station/utility experience, required re-inspections, the non- modeled program piping **AND** engineering judgment.

(c) **IF** a selected inspection location is determined to be excessively difficult, impractical **OR** costly to examine due to inaccessibility, temperature, ALARA concerns, scaffolding requirements, **OR** other factors, **THEN** an equivalent alternate inspection location may be selected.

(d) Components selected shall be formally documented.

(e) The criteria for component selection should consider the following:

(1) Components selected from measured **OR** apparent wear found in previous inspection results.

(2) Components ranked high for susceptibility from current CHECWORKS evaluation.

(3) Components identified by industry events/experience via the Nuclear Network **OR** through the EPRI CHUG.

(4) Components selected to calibrate the CHECWORKS models.

(5) Components subjected to off normal flow conditions. Primarily isolated lines to the condenser in which leakage is indicated from the turbine performance monitoring system.

5.3[6](e) cont

(6) Engineering judgment / Other

(7) Piping identified from Work Orders (malfunctioning equipment, downstream of leaking valves, etc.).

(8) Susceptible piping locations (groups of components) contained in the Small Bore Piping database, which have **NOT** received an initial inspection.

(9) Piping identified from Condition Reports/ Corrective action, Work Orders (malfunctioning equip, downstream of leaking valves, etc.).

(10) Vessel Shells – Feed-water heaters, moisture separator re-heaters, drain tanks etc.

[7] Inspection schedule

(a) Inspection sequence **AND** schedule should be developed based on priority established by the FAC engineer considering repair/scope expansion potential. Consideration will also be incorporated based on other outage work priorities, job conflict **AND** system window duration.

(b) The FAC outage schedule should contain sufficient time for analysis **AND** evaluations of the components being inspected.

[8] Drawing Preparation

(a) For each component scheduled for inspection, an isometric **OR** other acceptable location drawing should be prepared prior to the outage that identifies the component to be examined. **WHEN** applicable ensure the component number is shown on the drawing.

[9] Obtain Minimum Acceptable Wall Thickness (t_{accpt})

(a) Obtain t_{accpt} values for each component to be inspected.

(b) The minimum acceptable wall thickness, t_{accpt}, values should be obtained from EN-CS-S-008-MULTI as applicable **OR** from an approved site method (e.g. FAC Manager).

(c) Values for t_{accpt} should be obtained from design engineering **OR** it may be delegated to another department **OR** qualified personnel. These values may be ascertained prior to **OR** during an outage.

5.3 cont.

[10] Component Identification

(a) Inspected components should have a unique identifier to allow for the tracking of inspection data.

(b) Component identifiers may allow for the identification of the Unit, system, sub-system, line number **AND** corresponding location of that component within a sub-system.

(c) Components in the CHECWORKS non-modeled piping may be identified by using line numbers.

[11] Pre-inspection Activities

(a) Review inspection schedule, inspection requirements **AND** sequence with appropriate plant personnel to ensure requirements for the completion of the FAC inspection are understood.

(b) The FAC engineer should participate in the preparation of FAC inspection work packages as required.

5.4 GRIDDING

[1] Gridding of components shall be performed in accordance with recommendation of NSAC 202L, ENN-EP-S-005 (for ENN plants only), **AND** applicable site approved procedures **OR** as specified by the FAC engineer.

[2] Gridding information shall be documented on the appropriate NDE UT data sheet either by a sketch **OR** digital photo.

5.5 NDE TEST METHODS AND DOCUMENTATION

[1] Components can be inspected for FAC wear using ultrasonic testing (UT), radiography testing (RT), visual observation **OR** other approved methods. The inspection technique used shall be at the discretion of the FAC engineer.

[2] UT thickness measurement is the primary method of determining pipe wall thickness.

(a) Inspections will be performed by using one of the following techniques:

(1) Grid Point Reading

(2) Grid Scan

(3) Quadrant Scan

5.5[2](a) cont.

(4) Line Scan

(5) Full Scan

(b) Ultrasonic Thickness measurement shall be performed in accordance with approved NDE, site **OR** vendor procedures.

(c) A data sheet for components inspected shall be prepared. The information included in the sheet should contain but is **NOT** limited to the following:

(1) Plant's name/unit

(2) Components name

(3) Component sketch

(4) NDE technician signature/ date

(5) Grid size

(6) Axial **AND** radial grid boundaries

(7) Calibration information

(8) Level II **OR** Level III signature/date

(9) Work order information

(10) Nominal & Measured thickness

(11) 87.5% nominal thickness screening criteria

(12) Scanning method

(13) t_{accpt} or administrative limits

[3] Radiograph Testing

(a) RT (digital **OR** conventional) is the preferred method for inspecting socket welded fittings. The method used is at the discretion of the FAC engineer.

(b) RT can be performed during plant operations without removing insulation

[4] Visual Observation

(a) Visual observation/techniques may be used for examination of large components such as tanks, cross-around piping, cross-under piping, pump casings, shell walls, valves etc. (visual techniques is only applicable to two phase flow).

(b) Follow-up UT examinations, at the discretion of the FAC engineer, may be required of areas where significant damage is observed **OR** suspected.

5.6 EVALUATION OF UT INSPECTION DATA

> NOTE
>
> Historically, typical manufacturing practice has been to supply fittings (especially tees, elbows **AND** reducers) with wall thickness significantly larger than the piping nominal thickness.

> NOTE
>
> Evaluation of UT inspection data described in Steps [1] through [11] shall be performed by qualified FAC personnel or designated personnel qualified in accordance with EN-DC-126.

[1] The data review should consider screening for further evaluation. Factors that should be considered **WHEN** reviewing the inspection data include unknown initial thickness (especially fittings), counter-bore, obstructions, **AND** manufacturing wall thickness variations.

[2] For each component that is examined **AND** is below the screening criteria of 87.5% of nominal wall, the wear, wear rate, remaining service life shall be calculated prior to placing the component back in-service. Systems/Components with margins that exceed the 87.5% screening criteria or where site specific procedures impose more stringent requirements are excluded from these criteria.

[3] The FAC Program Engineer **OR** designee shall review the UT data to ensure that the data is complete **AND** corresponds to the requirements specified on the inspection data sheet (i.e., grid size, spacing, flow direction, starting **AND** ending locations, obstructions, missing data, suspect readings **AND** orientation).

[4] **IF** low readings are encountered from repeat inspections that are due to counter-bore, **THEN** those areas shall be noted **AND** additional inspections are **NOT** required.

[5] Grid Refinement

(a) A grid reduction / refinement may be used **IF** the minimum measured thickness is less than the minimum required wall thickness, severe wall thinning is detected, engineering judgment, **OR** the projected thickness is less than the minimum required wall thickness **OR** as directed by the FAC engineer.

(b) The results of the grid refinement **OR** scan shall be documented on an inspection data sheet.

5.6 cont.

[6] Grid Extension

(a) **IF** measurement indicates wall loss at any edge of the grid, **THEN** the grid should be extended until the entire wear pattern is mapped.

[7] Determination of Initial Wall Thickness

(a) Initial Thickness (t_{init}): The thickness determined by ultrasonic examination prior to the component being placed into service (baseline) **OR** the first ultrasonic examination during its service life. **IF** an examination has **NOT** previously been performed on the component, the initial thickness shall be determined by reviewing the initial ultrasonic data for that component. The area of maximum wall thickness within the same region as the worn area (based on the method selected for evaluating wear) shall be identified **AND** compared to t_{nom}. **IF** the thickness is greater than t_{nom}, the maximum wall thickness within that region shall be used as t_{init}. **IF** that thickness is less than t_{nom}, t_{nom} shall be used as t_{init}.

[8] Determination of Wear

(a) Wear of piping components may be evaluated using the band, area, **AND** blanket **OR** point-to-point method as defined in NSAC-202 L, latest revision **OR** any other approved method.

(b) Evaluation of inspection data that is determined to require wear evaluation shall be documented **AND** reviewed.

[9] Wear rate Determination

(a) Wear rate is determined by wear/ unit time (Units to be consistent with thickness evaluation).

(b) A reasonable safety factor should be applied to the wear rates to account for inaccuracies in the FAC wear rate calculations.

(c) Wear rate evaluation should be evaluated on a component evaluation sheet.

[10] Predicted Thickness (t_p , t_{pred})

(a) The projected **OR** predicted thickness to the next schedule refueling outage.

$$t_{pred} = t_{meas} - \text{Safety factor x Wear Rate x Time}$$

A safety factor of 1.1 should be applied to all Entergy nuclear plants. **IF** a value less than 1.1 is used the reason shall be documented.

5.6 cont.

[11] Determination of Remaining Service Life (RSL)

(a) Remaining service life (RSL) shall be evaluated as follows, units to be consistent with thickness evaluation:

$$RSL = (t_{meas} - t_{accpt}) / (\text{Safety Factor x Wear Rate})$$

5.7 EVALUATION OF RT INSPECTION DATA

[1] Qualified NDE personnel shall interpret the film **AND** report the examination result to the FAC engineer.

[2] Appropriate conservatism should be used to determine **IF** a component requires replacement **OR** re-inspection as a consequence of qualitative nature of RT.

[3] RT inspection shall be recorded on a data sheet.

5.8 EVALUATION OF VISUAL INSPECTION DATA

[1] Where accessible, visual inspections may be performed on two-phase flow lines.

[2] Follow-up UT inspection is required for locations where significant damage is observed **OR** suspected.

[3] Due to the qualitative nature of visual inspections, appropriate conservatism should be used **WHEN** determining whether a component is acceptable to return to service **AND WHEN** establishing a re-inspection frequency.

5.9 DISPOSITION OF INSPECTION RESULTS

[1] The following are used to disposition component inspection results. Reference attachment 9.3 for logic diagram

NOTE
Certain components may have very little margin remaining as a consequence of high stresses in the line even though $t_{pred} \geq 0.875\ t_{nom}$ **AND** therefore may require evaluation, for example Feedwater, Condensate, RHR, etc.

[2] **IF** t_{pred} is $\geq 0.875\ t_{nom}$, the component is acceptable as is **AND** may be returned to service.

[3] **IF** t_{pred} is $< 0.875\ t_{nom}$, evaluate for sample expansion (Reference section 5.12).

5.9 cont.

[4] **IF** t_{pred} is ≤ 0.3 t_{nom}, for ISI Class 1 piping repair **OR** replacement is required in accordance with the requirements of ASME Section XI Repair and Replacement Program.

[5] **IF** t_{pred} is ≤ 0.2 t_{nom}, for ISI Class 2, Class 3 **AND** non-safety related, repair, replace **OR** evaluate as warranted in accordance with applicable site programs **OR** as directed by the FAC engineer.

[6] **IF** t_{pred} is ≥ t_{accpt}, the component is acceptable for continued operations, however monitoring is required in accordance with program requirements.

[7] **IF** t_{pred} is < t_{accpt}, a structural evaluation is required in accordance with site approved procedures **OR** engineering standards. Also a sample expansion evaluation is required. Repair or replacement in accordance with the requirements of ASME Section XI Repair and Replacement Program **OR** other site approved process may also be required.

[8] **IF** t_{meas} is < t_{accpt}, **generate a condition report**. A structural evaluation is also required in accordance with applicable site procedures **OR** engineering standards.

5.10 RE-INSPECTION REQUIREMENT

[1] **IF** the remaining service life (RSL) of a component is greater than **OR** equal to the number of hours in the next operating cycle, **THEN** the component may be returned to service.

[2] **IF** the component's remaining service life (RSL) is greater than the number of hours in the next operating cycle but is less than the number of hours in the next two operating cycles, **THEN** the component should be considered for re-inspection, repair or replacement during the next scheduled outage.

[3] **IF** the component is acceptable for continued service, **THEN** it shall be re-examined before **OR** during the outage immediately prior to the cycle during which it is projected to wear to the minimum allowable wall thickness.

5.11 COMPONENTS FAILING TO MEET INITIAL SCREENING CRITERIA

[1] **IF** the results of the remaining life evaluation are shorter than the amount of time until the next scheduled inspection, there are several options for disposition of the component, as follows:

(a) Shorten the inspection interval (for components that can be inspected online)

5.11[1] cont.

(b) Refine the t_{accpt} value through a detailed stress analysis, which should be provided by Design Engineering **OR** designee.

(c) Repair or replace the component

(d) ISI Class1 components that are less than **OR** equal to 0.3 t_{nom} must be repaired **OR** replaced unless further structural evaluation permits continued service.

[2] Wall thinning resulting in less than t_{accpt} shall be reported immediately to the FAC engineer by verbal **OR** written communications.

[3] A condition report shall be generated **WHEN** significant wall thinning **OR** unexpected wear is detected in a system **OR** component.

[4] A condition report shall be generated for wall thinning below t_{accpt} **OR** other site established limit **AND** a subsequent structural evaluation performed to disposition the line for continued service.

[5] **IF** a previous condition report was generated for a component with wall thinning **THEN** no new condition report is required provided that the associated structural evaluation is current **AND** applicable.

5.12 SAMPLE EXPANSION

[1] **IF** a component is discovered that has a current **OR** projected wall thickness less than the minimum acceptable wall thickness (t_{accpt}), **THEN** additional inspections of identical **OR** similar piping components in a parallel **OR** alternate train shall be performed to bound the extent of thinning except as provided below. Reference section 5.12[2].

[2] **WHEN** inspections of components detects significant wall thinning **AND** it is determined that sample expansion is required, the sample size for that line should be increased to include the following:

(a) Components within two diameters downstream of the component displaying significant wear **OR** within two diameters upstream **IF** the component is an expander **OR** expanding elbow.

(b) A minimum of the next two most susceptible components from the relative wear ranking in the same train as the piping component displaying significant wall thinning.

5.12[2] cont.

(c) Corresponding components in each other train of a multi-train line with a configuration similar to that of the piping component displaying significant wall thinning.

[3] **IF** the expanded inspection scope detects additional degradation, the sample expansion should continue until no additional components with significant wear are detected.

[4] Sample expansion is **NOT** required **IF** the thinning was expected **OR** **IF** the thinning is unique to that component (e.g., degradation downstream of a leaking valve).

[5] Inspections of components from the current **OR** past outages may satisfy the sample expansion criteria, therefore, some of the sample expansion requirements can be met without performing additional inspections.

[6] Sample expansion is **NOT** required for components that are being re-inspected **IF** normal **OR** expected wear is detected **OR** wear unique to that component. All other wear patterns encountered shall be evaluated by the FAC Engineer to determine **IF** sample expansion is required.

5.13 REPAIR / REPLACEMENT OF DEGRADED COMPONENTS
[NRC Generic Letter 90-05]

[1] The FAC engineer shall generate applicable documents to facilitate repair or replacement of degraded **OR** deficient components.

[2] Components experiencing severe **OR** unacceptable wear should be replaced with corrosion resistant material. However like in kind replacement may be appropriate **IF** procurement of a resistant material would delay plant restart.

[3] Replacing components **OR** fitting-by-fitting that have experienced significant wear is a satisfactory approach to reducing wear **IF** the wear is very localized (i.e., wear is concentrated downstream of a flow control valve **OR** orifice).

[4] Repairs and replacements to piping **AND** components within the scope of Class 1, 2, 3 shall be performed in accordance with the requirements of ASME Section XI Repair and Replacement Program.

[5] All temporary non-code repairs to ISI Class 1, 2, 3 shall comply with NRC Generic Letter 90-05.

5.14 COMPONENT EVALUATION PACKAGES

[1] The FAC Engineer **OR** designee shall assemble a component evaluation package for each examined component which may contain some of, but is **NOT** limited to the following:

(a) UT DATA Sheet

(b) Isometric drawing(s), sketches, flow diagram **AND** digital photo.

(c) Reference to Structural /Minimum wall evaluation

(d) Component evaluation data sheet.

5.15 POST- INSPECTION ACTIVITIES

[1] The FAC Program Engineer shall prepare an Outage Summary report to document the outage FAC activities **AND** submit to Records for retention in accordance with applicable procedures.

[2] Update CHECWORKS models with inspection data.

[3] Update small bore susceptible report as applicable

[4] Update all applicable FAC reports.

[5] Update FAC System Susceptible (SSE) Report and Susceptible Non-Modeled Program every two cycles.

5.16 LONG TERM STRATEGY

[1] Entergy's fleet long-term strategy shall focus on reducing the plant's FAC susceptibility. Optimization of the inspection planning process is an important factor. However, the reduction of FAC wear rates is necessary **IF** both the number of inspections **AND** the probability of failure are to be reduced. Subsequently the fleet's long term strategy will include the following elements:

(a) The use of improved materials for replaced components **OR** proactive replacement of piping with corrosion resistant material.

(b) Utilization of improved water chemistry

(c) Incorporation of local design changes.

(d) Optimization of the inspection planning process,

(e) Industry participation in meetings for technology and information transfer (e.g. EPRI CHUG).

5.16[1] cont.

(f) Maintaining up-to-date predictive software **AND** incorporating the latest inspection data in the models.

5.17 METHODS OF DETERMINING PLANT PERFORMANCE

[1] Program performance indicators, self- assessments **AND** bench marking are utilized as methods for monitoring program **AND** plant performance.

6.0 INTERFACES

[1] EN-CS-S-008-MULTI, “Pipe Wall Thinning Structural Evaluation”.

[2] ENN-EP-S-005, "Flow Accelerated Corrosion Component Scanning and Gridding Standard".

[3] EN-DC-202, “NEI 03-08 Materials Initiative”.

[4] EN-LI-102, “Corrective Action Process.”

[5] CEP-NDE-0505,”Ultrasonic Thickness Examination”

[6] EN-DC-126, “Calculations”.

[7] EN-DC-115, Engineering Change Development”

[8] Site ASME XI Repair / Replacement Program as applicable.

[9] NSAC 202L, latest revision, EPRI Document, "Recommendations for an Effective Flow Accelerated Corrosion Program”

7.0 RECORDS

[1] Record retention shall be in accordance with site procedures.

8.0 SITE SPECIFIC COMMITMENTS

Step	Site	Document	Commitment Number or Reference
[1]	JAF	Response to NRC IE Bulletin 87-01	JAFP 87-0737
[2]	JAF	Response to NRC Generic Letter 89-08	JPN-89-051
[3]	IPEC Unit 3	Response to NRC IE Bulletin 87-01	IP3-87-055Z
[4]	IPEC Unit 3	Response to NRC Generic Letter 89-08	IPN-89-044
[5]	IPEC Unit 2	Response to NRC IE Bulletin 87-01	Mr. Murray Selman (Con Edison) to Mr. William Russell (NRC), Letter dated September 11, 1987.
[6]	Pilgrim	Response to NRC Generic Letter 89-08	BECo 89-107
[7]	VY	Response to NRC Generic Letter 89-08	Vermont Yankee letter to USNRC, FVY-89-66
[8]	VY	Response to NRC IE Bulletin 87-01	Vermont Yankee letter to USNRC, FVY-87-94
[9]	VY	Supplemental Response to NRC IE Bulletin 87-01	Vermont Yankee letter to USNRC, FVY-87-121
[10]	ANO	OCAN108914	P-1079
[11]	GGNS	GGNS Appendix K, Power Uprate	P-35269
[12]	GGNS	Response to NRC Generic Letter 89-08	P-24444
[13]	RBS	Response to NRC IE Bulletin 93-02	P-15802
[14]	RBS	Response to NRC IE Bulletin 93-02, Supp. 1	P-15803
[15]	WF3	Response to INPO SOER 87-03	P-16557
[16]	WF3	Response to IEN 89-001	P-20303
[17]	WF3	Response to IEN 93-021	P-22888
[18]	PLP	FAC Acceptance Criterion	RCL 01038934-01
[19]	PLP	Response to Generic Letter 89-08 Erosion/Corrosion Induced Pipe Wall Thinning	CMT891015777

9.0 ATTACHMENTS

9.1 Guidance on Parameters affecting FAC.

9.2 Flow Accelerated Corrosion Program Attributes.

9.3 Wall Thinning Evaluation Process Map.

GUIDANCE ON PARAMETERS AFFECTING FAC

Listed below are factors to be considered when reviewing work requests, component replacements and modification packages for possible impact on the content of the FAC Program governed by EN-DC-315. All Design Change Packages (DCP's) are required to be evaluated for impact to the FAC Program. This list is not intended to be all-inclusive or to limit the number of items an individual would consider when performing this impact assessment. It is intended as a reasonable list of items to consider for potential program content updates.

1. Water Chemistry. Many water chemistry parameters have been shown to contribute to FAC.

   a. pH Control Amine – pH is the primary chemistry parameter affecting FAC rates in PWRs. However, the amine used to control pH also plays an important role. Amines such as ammonia tend to separate more into the steam phase in two-phase flow conditions, and therefore provide less protection in the drains. Amines such as morpholine and especially ethanolamine have better partitioning characteristics for FAC.

   b. In a BWR, pH has much less of a role since the pH is stable and there are no amine's added to control the pH. FAC rates decrease as pH level increases. FAC rates seem to drop considerably at pH values of greater than 9.3 - 9.5.

   c. Oxygen Content - FAC rates decrease as oxygen concentration increases. Values that typically result in minimum FAC rates are approximately 15 to 20 ppb.

   d. Hydrogen Water Chemistry – BWR Plants that do not have hydrogen addition normally have a main steam oxygen content near 18 ppm. Plants with hydrogen water chemistry typically have an oxygen content from 3 to 12 ppm. This has a potential to impact the corrosion rates in the LP steam systems; mainly the first and second stage reheater drains based on industry experience.

   e. Hydrazine Injection - Hydrazine is added to the feed train of PWRs as an oxygen scavenger and to maintain a reducing environment in the steam generators. From zero to approximately 150 ppb,an increase in hydrazine concentrations seems to increase rates of FAC. Higher concentrations seem to result in no further increase in FAC rates. EPRI recommends the use of high levels of hydrazine (>100 ppb) to protect steam generator tubes; however, this can result in accelerated rates of FAC in the feed train. Although CHECWORKS does not currently model high hydrazine conditions, any model updates performed after the release of version 1.0F should carefully consider hydrazine concentrations.

   f. Zinc Injection - Industry experience has shown that zinc injection decreases corrosion and FAC wear rates due to the concentration of zinc at the oxide surface. The amount of reduction depends on the amount of zinc at the surface.

2. Piping Geometry - Piping geometry is one of the most important factors in FAC. Generally, geometries that produce the greatest turbulence also produce the highest FAC rates. Listed below are examples of obvious items that should be considered in any assessment:

    a. Addition or replacement of fittings, bends and branch connections.

    b. Like for like replacement of any fitting in a system that is susceptible to FAC damage or is part of system that is already part of the FAC Program.

    c. Alterations or repairs encountered in the nozzles or walls of FW heaters, MSR, Drain Tanks, FW Pumps, HD Pumps or CD/CB Pumps.

    d. Throttled Valves.

3. Piping Material Composition - Alloying elements improve the resistance of piping systems to FAC. In ascending order of resistance, the following table presents the degree of improvement over carbon steel:

Material	Nominal Composition	Rate (carbon steel) / Rate (alloy)
P11	1.25% Cr, 0.50% Mo	34
P22	2.25% Cr, 1.00% Mo	65
304	18% Cr	>250

4. In-Line Components - Addition or replacement of such components as thermowells, flow elements and pressure-reducing orifices should be evaluated. The local effects caused by these components can generate FAC damage in areas where overall conditions don't indicate the need for inspections.

5. Component Supports - Additions or deletions of components supports which could result in the need for a review of the existing code minimum wall value or a new code minimum wall calculation.

6. Operational Changes - System operational changes such as the normal operation of emergency heater drains, switching of spare components, extended use of normal start-up or by-pass lines, etc.

ATTACHMENT 9.1 **GUIDANCE ON PARAMETERS AFFECTING FAC**

Sheet 3 of 3

7. Component Replacements – Records should be updated for like for like replacement of fittings already in the program including new baseline data, changing next scheduled inspection due date, etc. Note and track whether the replacement components have had surface preparation and a UT grid applied for future outage planning.

8. External Sources – Information concerning FAC Inspection results from other stations and Nuclear Plants operated by others. General information distributed by EPRI Reports, INPO & NRC Bulletins, etc. should also be considered.

9. Maintenance History – A review of the maintenance performed on valves, orifices, steam traps, etc. should be considered. Valves that have had seat leakage can cause very localized wear in systems normally exempted. Plugged traps create water pockets in steam systems that accelerate metal loss. Eroded orifices can cause increased metal loss due to decrease in back pressure and increase in flow rates.

ATTACHMENT 9.2 — FLOW ACCELERATED CORROSION PROGRAM ATTRIBUTES

Sheet 1 of 1

PROGRAM ATTRIBUTES

Attributes:

Program Infrastructure

(a) Program Structure: Roles & Responsibilities, Program Ownership, Organizational Interfaces, etc.
(b) Configuration management
(c) Program Bases
(d) Engineering Documentation
(e) Flow Accelerated Corrosion System Susceptibility Evaluation, Latest Revision.
(f) CHECWORKS models
(g) Change processes

Program Staffing and Experience

(a) Background and Expertise.
(b) Qualification and training.
(c) Bench Strength
(d) Time Allotment
(e) Industry Participation

Program Implementation

(a) Work control
(b) Inspections
(c) Maintenance and Repairs
(d) Control of Changes and Deferrals
(e) Review of INPO Operating Experience documents, CHUG operating experience, NRC notices.

Health Monitoring:

(a) System Engineering Health reports.
(b) FAC Quarterly Health Reports.

Effective Assessment:

(a) Perform FAC Self-Assessment on a periodic basis or as defined by applicable procedures.

Oversight:

(a) Effective assessment, Benchmarking or Audits.

ATTACHMENT 9.3 **WALL THINNING EVALUATION PROCESS MAP**

Sheet 1 of 1