## AMP 119 ONE-TIME INSPECTION (VERSION 2020)

### Programme Description

A one-time inspection of selected components or structures is used to verify the system-wide effectiveness of an ageing management programme (AMP) that is designed to prevent or minimize ageing to the extent that it will not cause the loss of intended function during the period of long term operation [1, 2]. For example, effective control of water chemistry under AMP 103 can prevent some ageing effects and minimize others. However, there may be locations that are isolated from the flow stream for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain ageing effects.

This programme can also be used to verify the significance of an ageing effect. Situations in which additional confirmation is appropriate include:

* An ageing effect is not expected to occur, but the data are insufficient to rule it out with reasonable confidence;
* An ageing effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than generally expected.

For these cases, confirmation demonstrates that either the ageing effect is not occurring, or the ageing effect is occurring very slowly and does not prevent the component, structure or system from performing their intended function during the period of extended operation based on prior operating experience data.

This programme does not address Class 1/Quality Group A piping (pressure retaining boundary) less than nominal pipe size (NPS) 4 inch (100 mm). That piping is addressed in AMP 121.

An acceptable (one-time inspection) programme to verify system-wide effectiveness of an AMP may consist of a one-time inspection of selected components and susceptible locations in the selected system. Verification may include a review of routine maintenance, repair, or inspection records to confirm that selected components have been inspected for ageing degradation and that significant ageing degradation has not occurred. The elements of the programme include:

* Determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible ageing effects, and operating experience;
* Identification of the inspection locations in the system or component based on the potential for the ageing effect to occur;
* Determination of the examination technique, including acceptance criteria that would be effective in managing the ageing effect for which the component is examined; and
* Evaluation of the need for follow-up examinations to monitor the progression of ageing if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

A one-time inspection programme is acceptable to verify the effectiveness of AMP 103, AMP 133, and AMP 136.

### Evaluation and Technical Basis

1. ***Scope of the ageing management programme based on understanding ageing:***

The scope of this programme includes systems and components that are subject to ageing management using AMP 103, AMP 133, and AMP 136 and for which no ageing effects have been observed or for which the ageing effect is occurring very slowly and does not affect the component’s or structure’s intended function during the period of extended operation based on prior operating experience data. The scope of this programme also may include other components and materials where the environment in the period of extended operation is expected to be equivalent and for which no ageing effects have been observed.

The programme cannot be used for structures or components subjected to known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent. Periodic inspections are proposed in these cases. Normally, one-time inspection of selected components is conducted just prior to the beginning of a period of long-term operation.

The scope of this programme is based on the comprehensive survey, taking into account the maximum possible volume of maintenance work during the preparation of the unit for long term operation (LTO).

1. ***Preventive actions to minimize and control ageing degradation:***

One-time inspection is a condition monitoring programme. It does not include methods to prevent age-related degradation.

1. ***Detection of ageing effects:***

Where practical, the inspection includes a representative sample of the system population and focuses on the bounding or lead components most susceptible to ageing due to time in service, and severity of operating conditions. For components managed by AMP 103, AMP 133, and AMP 136, a representative sample size for a one-time inspection may be limited to (e.g., 20 % of the population) defined as components having the same material, environment, and ageing effect combination or a maximum of 25 components according to [1]. Otherwise, a technical justification of the methodology and sample size is used for selecting components for one-time inspection is included as part of the programme’s documentation.

In case of a fleet of plants (e.g., France), periodic inspections may be performed on some representative components of different plants and use the result to demonstrate the capability of components to fulfill safety function.

The inspection and test techniques have a demonstrated history of effectiveness in detecting the ageing effect(s) of concern and rely on established NDE techniques (e.g., [3-6]), including visual, ultrasonic, and surface techniques. Inspections are performed by personnel qualified in accordance with site procedures and programmes to perform the type of examination specified. The programme monitors parameters directly related to the (anticipated) age-related degradation of a component. Examples of parameters monitored and the related ageing effect are provided in the table below.

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| **Examples of Parameters Monitored or Inspected and Ageing Effect for Specific Structure or Component[[1]](#footnote-1)** | | | |
| **Ageing Effect** | **Ageing Mechanism** | **Parameter(s) Monitored** | **Inspection Method[[2]](#footnote-2)** |
| Loss of Material | Crevice Corrosion | Surface Condition, Wall Thickness | Visual (VT-1 or equivalent) and/or Volumetric (ultrasonic testing [UT]) |
| Loss of Material | Galvanic Corrosion | Surface Condition, Wall Thickness | Visual (VT-3 or equivalent) and/or Volumetric (UT) |
| Loss of Material | General Corrosion | Surface Condition, Wall Thickness | Visual (VT-3 or equivalent) and/or Volumetric (UT) |
| Loss of Material | MIC | Surface Condition, Wall Thickness | Visual (VT-3 or equivalent) and/or Volumetric (UT) |
| Loss of Material | Pitting Corrosion | Surface Condition, Wall Thickness | Visual (VT-1 or equivalent) and/or Volumetric (UT) |
| Loss of Material | Erosion | Surface Condition, Wall Thickness | Visual (VT-3 or equivalent) and/or Volumetric (UT) |
| Reduction of Heat Transfer | Fouling | Tube Fouling | Visual (VT-3 or equivalent) |
| Cracking | SCC or Cyclic Loading | Surface Condition, Cracks | Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant) or Volumetric (radiographic testing or UT) |

With respect to inspection timing, the sample of components inspected before the end of the current operating term needs to be sufficient to provide reasonable assurance that the ageing effect will not compromise any intended function during the period of extended operation. Specifically, inspections need to be completed early enough to ensure that the ageing effects that may affect intended functions early in the period of extended operation are appropriately managed. Conversely, inspections need to be timed to allow the inspected components to attain sufficient age to ensure that the ageing effects with long incubation periods (i.e., those that may affect intended functions near the end of the period of extended operation) are identified. Within these constraints, the inspection is performed in such a way as to minimize the impact on plant operations and after sufficient time of operation, e.g. as a plant will have operated for at least 30 years before inspections under this programme begin, sufficient time will have elapsed for any ageing effects to be manifested.

1. ***Monitoring and trending of ageing effects:***

Inspection results for each material, environment, and ageing effect are compared to those obtained during previous inspections when available. Where practical, these results are trended in order to project observed degradation to the end of period of extended operation [3].

1. ***Mitigating ageing effects:***

A one-time inspection programme is not intended to mitigate ageing effects.

1. ***Acceptance criteria:***

Any indication or relevant conditions of degradation detected are evaluated. Acceptance criteria may be based on applicable standards, design basis information, or vendor-specified requirements and recommendations. For example, ultrasonic thickness measurements are compared to predetermined limits. However, crack-like indications are not acceptable [3].

1. ***Corrective actions:***

Unacceptable inspection findings are evaluated in accordance with the site’s corrective action process to determine appropriate corrective actions and the need for subsequent (including periodic) inspections under another AMP.

Additional inspections are conducted if one of the inspections does not meet acceptance criteria. The number of increased inspections is determined in accordance with the site’s corrective action process. Where an ageing effect identified during an inspection does not meet acceptance criteria or projected results of the inspections do not meet the acceptance criteria, a periodic inspection programme is developed and implemented at all of the units on site with same combination(s) of material, environment, and ageing effect.

Where measurable degradation has occurred, but acceptance criteria have been met, the inspection results are entered into the corrective action programme for future monitoring and trending [3].

1. ***Operating experience feedback and feedback of research and development results:***

This AMP addresses the industry-wide generic experience. Relevant plant-specific operating experience is considered in the development of the plant AMP to ensure the AMP is adequate for the plant. The plant implements a feedback process to periodically evaluate plant and industry-wide operating experience and research and development (R&D) results, and, as necessary, either modifies the plant AMP or takes additional actions (e.g. develop a new plant-specific AMP) to ensure the continued effectiveness of the ageing management.

The elements that comprise inspections associated with this programme (the scope of the inspections and inspection techniques) are consistent with industry practice and – if applicable – recent results from R&D. An operator’s operating experience with detection of ageing effects is considered to be adequate to demonstrate that the programme is capable of detecting the presence or noting the absence of ageing effects in the components, materials, and environments where one-time inspection is used to confirm system-wide effectiveness of another preventive or mitigative AMP. For more information, EPRI has a report on NDE experience in [7].

At the time when this AMP was produced/reviewed, no relevant R&D was identified.

1. ***Quality management:***

Site quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the different national regulatory requirements (e.g., 10 CFR 50, Appendix B [8]).

### References

[1] UNITED STATES NUCLEAR REGULATORY COMMISSION, Generic Aging Lessons Learned (GALL) Report — Final Report (NUREG-1801, Revision 2), USNRC, 2010

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Final Report of the Programme on Safety Aspects of Long Term Operation of Water Moderated Reactors, IAEA Programmatic Guidelines for Ageing Management, IAEA-EBP-SALTO, IAEA, Vienna 2007

[3] UNITED STATES NUCLEAR REGULATORY COMMISSION, NUREG–2191, Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, Final Report, USNRC, 2017

[4] AMERICAN SOCIETY of MECHANICAL ENGINEERS, ASME Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, The ASME Boiler and Pressure Vessel Code, as approved in 10 CFR 50.55a, ASME, New York

[5] ELECTRIC POWER RESEARCH INSTITUTE, Materials Reliability Program: Inspection Standard for PWR Internals - 2018 Update (MRP-228, Rev.3), (EPRI 3002010399), EPRI, Palo Alto, CA, 2018

[6] ELECTRIC POWER RESEARCH INSTITUTE, BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines, BWVIP-03, (EPRI 1025142-R15), EPRI, Palo Alto, CA, 2012

[7] ELECTRIC POWER RESEARCH INSTITUTE, Update on License Renewal one-time inspection and best NDE practices, (EPRI 1022931), EPRI, Palo Alto, CA, 2011

[8] UNITED STATES NUCLEAR REGULATORY COMMISSION, Title 10 Part 50 of the Code of Federal Regulations (10 CFR 50), Appendix B, Quality Assurance Criteria for Nuclear Power Plants, Office of the Federal Register, National Archives and Records Administration, USNRC, Latest Edition

1. The examples provided in the table may not be appropriate for all relevant situations. If an alternative to the recommendations in this table is chosen, a SSC specific technical justification is provided giving sufficient information on examination technique, acceptance criteria, evaluation standard, and a description of the justification. [↑](#footnote-ref-1)
2. Visual inspection may be used only when the inspection methodology examines the surface potentially experiencing the ageing effect. [↑](#footnote-ref-2)