

efficiency bulletin

September 15, 2016

Efficiency Bulletin: 16–25

Critical Component Reduction

The definition of “critical component” will be changed to include only those that can cause the following upon failure of the component: reactor trip/scram, power reduction greater than 20 percent, MSPI component failure, or the complete loss of a critical safety function or Maintenance Rule high safety-significant/risk-significant function.

Addressees: Chief nuclear officers, NEI APCs and INPO APCs

Issue: ENG-001, Critical Component Reduction

Background

- This bulletin is the first in a series to focus station equipment reliability processes on the most critical components. The change to the critical component definition supports the framework for consistent implementation of cost-effective maintenance in the nuclear energy industry. The change establishes a zero tolerance policy for critical components whose failure results in “unacceptable” consequences and facilitates the implementation of more cost-effective maintenance strategies for noncritical components, whose failures can be appropriately managed to reduce costs. Future efficiency bulletins, expected this year, will:
 - Provide “value-based maintenance” tools to optimize the costs of component maintenance while identifying possible adverse reliability effects caused by adjusting the maintenance strategies. Simply reducing preventive maintenance (PM) may not reduce costs if it results in increased corrective maintenance or regulatory scrutiny. Total costs and impact to the station should be considered when establishing components as noncritical and analyzing value-based maintenance strategies for noncritical components.

Color Code: Blue
Due: June 2017

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- Replace the discrete listing of attributes for the definition of noncritical components that drives them to be considered for PMs and replace the definition with scoping that uses a value-based approach for assessing total costs and impact.
- Use a graded approach to plan, assess and perform maintenance on lower criticality components.

Summary of Efficiency Opportunity

- Desired end-state—Reduce the number of critical components by as much as 50 percent.
- Value proposition (vision of excellence)—Indirect cost savings are anticipated through a reduction in maintenance process controls, parts quality/inventory controls, work management controls (such as PM change requests, technical justifications for PM deferrals and overdue PM tracking) and causal analyses associated with critical components. Guidance to extend PM frequencies will be addressed in subsequent efficiency bulletins, along with the industry tools to facilitate implementation.
- Why is it important?—Component classification has been an integral part of improving equipment reliability. By revising the critical component definition to include only those components whose direct failure could result in unacceptable consequences, there is an opportunity to improve station performance (safety and reliability) while reducing operational and maintenance costs.
- Industry benchmark value(s)—The equipment reliability index (ERI) continues to meet industry standards and improve.
- Measure of effectiveness—Maintain or improve industry performance for safety and reliability.

Relevant Standards

- Performance Objectives and Criteria (INPO) ER.1, Engineers establish high standards for equipment performance and promote intolerance for failures of critical equipment.
- Performance Objectives and Criteria (INPO) ER.2
 - Engineering and maintenance strategies focus on components and systems that are critical to safe, reliable plant operation. Components are classified as critical based on the relative importance for maintaining system function.
 - A thorough process is used to review and document the technical bases of deferrals, changes, additions and deletions of preventive maintenance tasks.
- Performance Objectives and Criteria (INPO) OF.1, Operational problems are evaluated individually and in the aggregate to determine the priority for resolution. Priorities are based on the impact 1) to the operator's ability to monitor and control the plant, 2) impact to operating margin, or 3) impact to high-risk-worth systems and components based on station probabilistic safety analysis.

Key to Color Codes:

Red: NSIAC initiative – full participation required for viability

Blue: Action expected at all sites, but is not needed for broad industry viability

Green: Utility discretion to implement, consistent with its business environment

Relevant Regulatory Requirement

- 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- Regulatory Guide 1.160, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Guidance

- AP-913, Equipment Reliability Process Description. The critical component definition has been revised as follows:
 - **Critical Components:** A credible single active component failure will directly result in any of the following unacceptable consequences:
 - Reactor scram/trip (single point vulnerability)
 - Significant power transient of > 20 percent plant transient [operational loss event (OLE)]
 - MSPI monitored component failure
 - Any single failure that causes a complete loss of any of the following critical safety functions:
 - ♦ Core, reactor coolant system or spent fuel pool heat removal
 - ♦ Containment isolation, temperature, pressure
 - ♦ Reactivity control
 - ♦ Vital AC electrical power
 - A single* equipment failure that results in the loss of a Maintenance Rule high-safety-significant or risk-significant function.
 - * *Single equipment failures that result in the loss of a redundant Maintenance Rule high-safety-significant or risk-significant function can be reclassified to noncritical **If** the controls for the processes for the scope, frequency and scheduling of the preventative maintenance tasks (preventative maintenance change request and deferral processes) explicitly require a review by the technical authority of maintenance strategy changes that could impact the reliability of critical, Maintenance Rule high-risk-significant and risk-significant components. The technical review shall include as a minimum the evaluation of a risk of failure focusing on the consequence of the failure and the potential for a loss of the critical function. These processes will also ensure proper evaluation of any reclassification of redundant Maintenance Rule high-risk-significant and risk-significant components to avoid undesired consequences when changing a component from critical to noncritical.*

Recommended Industry Actions

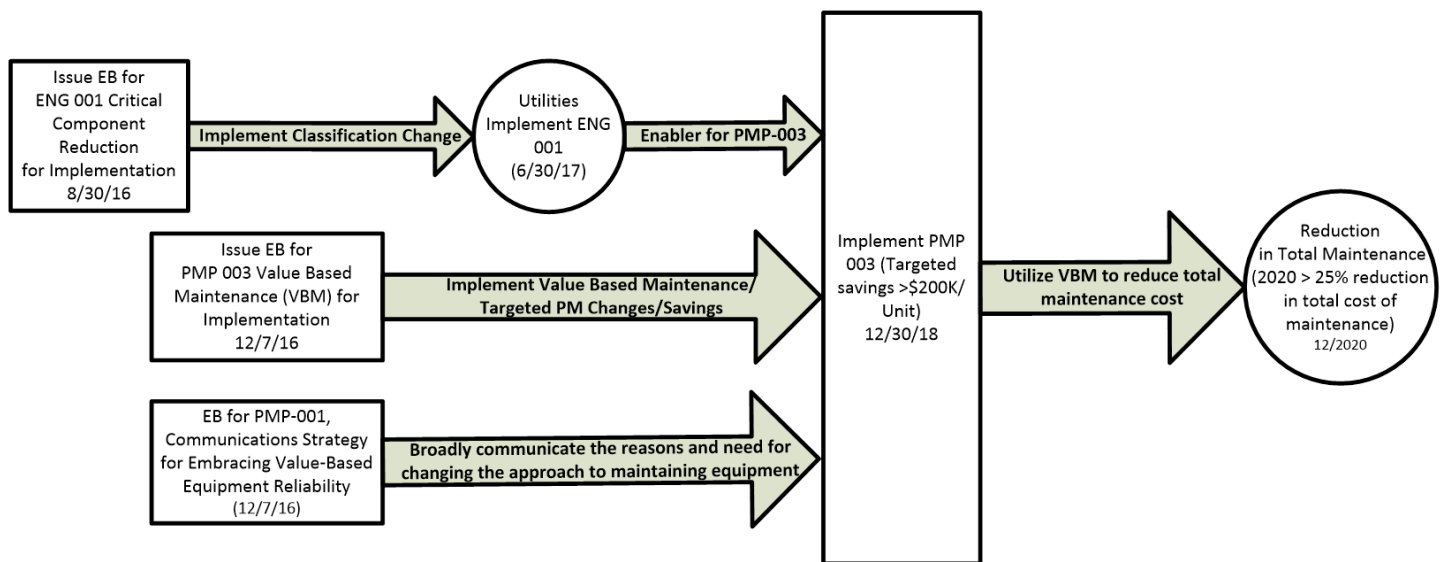
- Revise applicable fleet/station processes and procedures to incorporate the new critical definition.
- Implement change through a dedicated, cross-functional team to identify the subset of critical components that can be reclassified as noncritical. The participation of operations personnel and subject matter experts has been shown to be vital to the success of the project.

Change Management Considerations

Industry Activities

- Discuss change and change management at Equipment Reliability Working Group (ERWG) and other routine industry meetings.

- Industry webinar to provide background for the initiative, facilitate INPO and industry discussion, and to provide an open forum to clarify expectations and ask questions. Webinar information can be found at <https://web.inpo.org/Pages/Nuclear-Promise-Issues.aspx>.
- The following flow diagram provides an overview and coordination of the different activities:



Company Actions

- Site/fleet PM process owners revise governing processes and procedures.
- Sites/fleet establish a cross-functional team to implement change. As appropriate, operations, maintenance and work management personnel should be considered for the team.
- Corporate and site-wide communication on the initiative.

Guidrails

- Full implementation of this efficiency bulletin will result in many components previously classified as critical being reclassified as noncritical. Examples include components whose failure causes a half scram/partial trip, unplanned actuation of the engineered safety features actuation system (ESFAS), unplanned shutdown LCO actions statement less than or equal to 72 hours, or functional failure of a high-safety-significant or risk-significant system/function. Importantly, many of these formerly critical components may be safety-related, impact control room operations, affect reactivity management indicators or contribute to risk in the station PRA analyses. Consequently, stations should ensure that the following guiderails are in place:
 - Single equipment failures that result in the loss of a redundant Maintenance Rule high-safety-significant or risk-significant functions can be reclassified to noncritical **if** the controls for the processes for the scope, frequency and scheduling of the preventative maintenance tasks (preventative maintenance change request and deferral processes) explicitly require a review by the technical authority of maintenance strategy changes that could impact the reliability of critical, Maintenance Rule high-risk-significant and risk-significant components.
 - Critical components that are reclassified as noncritical should continue to be clearly differentiated in station processes so that appropriate maintenance strategies are maintained commensurate with component importance. Specifically, the station's administrative controls should ensure that regulatory and industry commitments (NRC, NERC, NEIL, etc.) are appropriately evaluated prior to any change in maintenance strategy.

- Critical components are often identified in downstream processes, such as critical spare parts or long-range plans to highlight their importance. The impact of reclassifying components as noncritical in these processes should be analyzed to ensure the changes do not result in an inappropriate business impact.
- The station impact of component failures (for example, whether the failure affects generation or would require the outage control center to be staffed) should be considered when changing the maintenance strategy of noncritical components.
- At a minimum, the set of performance indicators (Attachment 1) should be monitored to determine if unintended, adverse consequences begin to occur so that corrective action can be taken to arrest the adverse trend.

Report Your Site's Results

Please report your company's implementation of this improvement opportunity, including the date of completion. Send this information, along with your company point of contact, to EfficiencyBulletin@NEI.org.

Industry Contacts

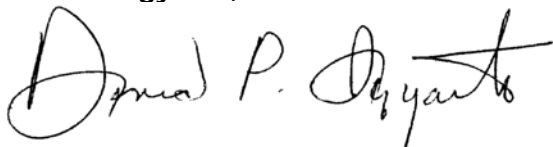
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Industry Approval:

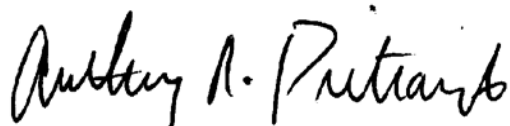
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Attachment 1 Performance Indicators

Full implementation of this Bulletin will result in the following components being reclassified from critical to non-critical. **Many of these formerly-critical components may be safety-related, impact control room operations, affect reactivity management indicators, or contribute to risk in the station PRA analyses.** The following indicators should be monitored, as a minimum, to determine if unintended adverse consequences begin to occur so that corrective action can be taken to arrest the adverse trend.

Reclassified as Non-Critical	Indicators
functional failure of a high-safety-significant or risk-significant system/function	<ul style="list-style-type: none"> ▪ Maintenance Rule functional failures ▪ Regulatory oversight process
half scram (BWR) or partial trip (PWR)	<ul style="list-style-type: none"> ▪ Half scram/partial trips
unplanned engineered safety features system actuation	<ul style="list-style-type: none"> ▪ Licensee event reports
unplanned shutdown LCO actions statement less than or equal to 72 hours	<ul style="list-style-type: none"> ▪ short-term unplanned LCO entries ▪ Online Reliability Loss Factor ▪ Unit Capability Factor ▪ Equipment Reliability Index (ERI)
unplanned power reductions of 20% or less	<ul style="list-style-type: none"> ▪ Online Reliability Loss Factor ▪ Unit Capability Factor ▪ Unplanned Power Reductions per 7000 Hours Critical (NRC Indicator) ▪ AP-913 Consequential Failure Events (ERI sub-indicator) ▪ Reactivity Management Performance Indices