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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

October 31, 2000

NRC REGULATORY ISSUE SUMMARY 2000-21
CHANGES TO THE UNPLANNED SCRAM AND UNPLANNED SCRAM WITH LOSS OF NORMAL HEAT REMOVAL PERFORMANCE INDICATORS

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this Regulatory Issue Summary (RIS) to inform power reactor licensees that a 6-month pilot test will be conducted to evaluate changes to the "unplanned scrams per 7,000 critical hours" and the "unplanned scrams with loss of normal heat removal" performance indicators (PIs) that are intended to minimize the potential for unintended consequences. This RIS also provides information on the process to be used by licensees participating in the pilot test to voluntarily submit PI data to the NRC beginning December 21, 2000. Submittal of PI information is a voluntary activity; therefore, this RIS requires no action or written response on the part of the addressees.

BACKGROUND INFORMATION

The Reactor Oversight Process (ROP) is built upon a framework directly linked to the Agency's mission. That framework includes cornerstones of safety. Within each cornerstone, a broad sample of information on which to assess licensee performance in risk-significant areas is gathered from PI data submitted by licensees and from the NRC's risk-informed baseline inspections. The PIs are not intended to provide complete coverage of every aspect of plant design and operation, but they are intended to be indicative of performance within related cornerstones. The data submitted by each licensee is used to calculate the PI values, which are then compared to risk-informed, objective thresholds.

Reporting of PI data to the NRC is a voluntary program in which all licensees participate. Historical data necessary to begin the program was submitted on January 21, 2000, using the guidelines of RIS 99-06, "Voluntary Submission of Performance Indicator Data," and NEI 99-02, Draft Rev. D, "Regulatory Assessment Performance Indicator Guideline." NEI 99-02 contains the general reporting guidelines used by the licensee to report PI data to the NRC. Implementation of the ROP began on April 2, 2000, using the guidelines of RIS 00-08 "Voluntary Submission of Performance Indicator Data," and NEI 99-02, Rev 0. The first submission of PI data for all operating reactor plants occurred on April 21, 2000.

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NRC has established a formal process to (1) address questions and feedback from internal and external stakeholders, (2) make changes to existing PIs and thresholds based on lessons learned, and (3) develop new PIs and associated thresholds. This formal process is being used to evaluate the changes described in this RIS, and will be documented in Inspection Manual Chapter 0608, "Performance Indicator Program," which will be issued soon.

SUMMARY OF ISSUE

Some industry representatives have expressed concern with including manual scrams in the "unplanned scrams per 7,000 critical hours" and "unplanned scrams with loss of normal heat removal" PIs. Commenters have stated that including manual scrams in the PIs could send the wrong message to licensee managers and operations personnel. This could potentially result in non-conservative decision making during a plant event for which a manual scram may be warranted. NRC is using its formal PI change process to evaluate alternative PIs that track initiating events in a way that is intended to minimize the potential for unintended consequences.

As a part of the change process, numerous public meetings were held to discuss and refine industry proposals for these alternative PIs. NRC has agreed to pilot test the "unplanned reactor shutdowns per 7,000 critical hours" and "unplanned reactor shutdowns with loss of normal heat removal" PIs (see attached for a detailed description).

The following plants have volunteered to participate in the pilot test: James A. FitzPatrick; Salem, Units 1&2; Hope Creek; Shearon Harris; Joseph M. Farley, Units 1&2; Vogtle, Units 1&2; Edwin I. Hatch, Units 1&2; Dresden Units 2&3; Prairie Island, Units 1&2; Palo Verde, Units 1,2,&3; Diablo Canyon Units 1&2; and Fort Calhoun.

The purpose of this pilot test is to collect data to determine if the alternative PIs are as effective as the existing PIs at providing an indication of performance in the initiating events cornerstone, while reducing the potential for unintended consequences.

In reaching its determination regarding the efficacy of the proposed PIs, the NRC will consider the following:

1. differences between data collected for the "unplanned reactor shutdowns per 7000 critical hours" and the "unplanned scrams per 7000 critical hours" PIs;

2. comparability of the data reported for the "unplanned reactor shutdowns with loss of normal heat removal" and the "unplanned scrams with loss of normal heat removal" PIs. Additionally, the NRC will compare the rate of occurrence of "unplanned reactor shutdowns with loss of normal heat removal" and the results presented in NUREG/CR-5750, "Rates of Initiating Events at U. S. Nuclear Power Plants: 1987 - 1995," Sections: Loss of Feedwater and Loss of Heat Sink Events, to identify differences;

3. the ability of licensees to report the requested data accurately and with minimal need for clarification;

4. the ability of each alternate PI to reduce the potential for unintended consequences without introducing other unintended consequences;

5. whether there are minimal changes in reporting burden for licensees.

Since the pilot plants will continue to be assessed using the existing PIs and not the proposed alternate PIs, no thresholds will be applied to the data reported in this pilot test. Thresholds are expected to be the same as those for the existing PIs, but will be determined subsequent to the pilot.

Based on the results of this pilot program, including consideration of stakeholder feedback, the NRC will decide whether to replace each current PI with the alternate PI.

VOLUNTARY ACTION

Addressees that are participating in this pilot program should conform to the guidance contained in this RIS for the voluntary submission of PI data. Send the PI data as an attachment to an e-mail message addressed to <pidata@nrc.gov> on or before December 21, 2000, to include data for October and November 2000, and by the 21st of the month following the end of each month thereafter. The data reporting phase of the pilot test ends on April 21, 2001, with the submission of data from the preceding month.

BACKFIT DISCUSSION

This RIS requires no action or written response. Any action on the part of addressees to collect and transmit PI data in accordance with the guidance contained in this RIS is strictly voluntary and, therefore, is not a backfit under 10 CFR 50.109. Therefore, the staff did not perform a backfit analysis.

FEDERAL REGISTER NOTIFICATION

A notice of opportunity for public comment on this RIS was not published in the *Federal Register* because the NRC has worked closely with NEI, industry representatives, members of the public, and other stakeholders since early 1998 on the development of NRC's ROP, including the collection of PI data. The NRC has solicited public comments on its intent to collect PI data in five *Federal Register* notices (dated January 22, April 19, May 26, July 19, and August 11, 1999), two Regulatory Issue Summaries: RIS 99-06 and 00-08, "Voluntary Submission Of Performance Indicator Data," and at numerous public meetings. The NRC will also issue a *Federal Register* notice soliciting public comment on the proposed PIs that are described in this RIS.

PAPERWORK REDUCTION ACT STATEMENT

This RIS contains a voluntary information collection that is subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid Office of Management and Budget (OMB) control number. The collection of this information is covered by OMB clearance number 3150-0195 which expires on October 31, 2002.

Please contact the person listed below with any questions about this matter.

/RA Charles E. Ader Acting for/
David B. Matthews, Director
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Attachments:

1. Unplanned Reactor Shutdowns per 7,000 Critical Hours
2. Unplanned Reactor Shutdowns with Loss of Normal Heat Removal
3. List of Recently Issued NRC Regulatory Issue Summaries

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Unplanned Reactor Shutdowns per 7,000 Critical Hours

Purpose

This indicator monitors the number of unplanned shutdowns of the reactor in response to off-normal conditions or events. It measures the frequency of unplanned shutdowns per 7,000 critical hours and provides an indication of initiating event frequency.

Indicator Definition

The number of unplanned shutdowns of the reactor in response to off-normal conditions or events during the previous four quarters while critical per 7,000 hours.

Data Reporting Elements

The following data are reported for each reactor unit:

- the number of unplanned shutdowns of the reactor in response to off-normal conditions or events while critical in the previous quarter
- the number of hours of critical operation in the previous quarter

Calculation

The indicator is determined using the values for the previous four quarters as follows:

$$\text{value} = \frac{\text{(number of unplanned reactor shutdowns while critical in previous 4 qtrs)}}{\text{(total number of hours critical in previous 4 qtrs)}} \times 7{,}000 \text{ hrs}$$

Definition of Terms

Unplanned reactor shutdown means the shutdown of the reactor in response to off-normal conditions or events by the unplanned addition of negative reactivity by any means, (e.g., insertion of control rods, boron, or opening reactor trip breakers). Unplanned reactor shutdowns are those that bring the reactor from criticality to a shutdown mode within 15 minutes of commencing to insert negative reactivity.

Criticality, for the purposes of this indicator, typically exists when a licensed reactor operator declares the reactor critical. There may be instances in which a transient initiates from a subcritical condition and is terminated by an unplanned reactor shutdown after the reactor is critical—this condition would count as an unplanned reactor shutdown.

Clarifying Notes

The value of 7,000 hours is used because it represents one year of reactor operation at about an 80% availability factor.

2,400 critical hours is the minimum number of critical hours in four consecutive quarters for which an indicator value is calculated. Rate indicators can produce high values that are misleading when the denominator is small; for critical hours under 2,400, a single shutdown can produce a value that crosses the green-white threshold. Therefore, the displayed value will be N/A. All data elements must nevertheless be reported.

Unplanned reactor shutdowns include those events that are reported under 10 CFR 50.72(b)(2)(iv)(B) which requires reporting of "any event or condition that results in actuation of the reactor protection system (RPS) when the reactor is critical except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation."

Examples of off-normal conditions or events include —

Turbine Trip
Loss of Main Feedwater Flow
Loss of Normal Heat Sink (main condenser)
MSIV Closure
Loss of Offsite Power
Loss of Electrical Load (includes generator trip)
Excessive Feedwater (overcooling transient)
Loss of Auxiliary/Station Power
Small Loss of Coolant Accident (includes reactor/recirculation pump seal failures)
Loss of Service Water/Component Cooling Water
Loss of Vital AC/DC bus
Secondary/balance-of-plant Piping/Component Ruptures
Reactivity Control Anomaly (e.g., dropped or misaligned rod)
Other Initiators Leading to Automatic Actuation of Reactor Protection System
Unplanned shutdowns made in response to plant conditions in accordance with off-normal procedures (e.g., emergency procedures, abnormal operating procedures, and alarm response procedures)

Reactor shutdowns that are not included:

Reactor shutdowns that are planned to occur as part of a test (e.g., a reactor protective system actuation test).
Reactor shutdowns that are part of a normal evolution made in accordance with normal plant procedures.

Included in the indicator are unplanned reactor shutdowns that occur during the execution of a procedure in which there is a high probability of a shutdown but the shutdown is not intended.

Unplanned Reactor Shutdowns with Loss of Normal Heat Removal

Purpose

This indicator monitors that subset of unplanned reactor shutdowns in which an unplanned loss of the normal heat removal path occurs shortly before or shortly after an unplanned reactor shutdown. These shutdowns are more risk-significant than uncomplicated, unplanned reactor shutdowns.

Indicator Definition

The number of unplanned reactor shutdowns while critical at or above the point of adding heat during the previous 12 quarters that were caused by or involved an unplanned loss of the normal heat removal path prior to establishing reactor conditions that allow use of the plant's normal long term heat removal systems.

Data Reporting Elements

The following data are reported for each reactor unit:

- the number of unplanned reactor shutdowns while critical at or above the point of adding heat in the previous quarter that were caused by or involved an unplanned loss of the normal heat removal path prior to establishing reactor conditions that allow use of the plant's normal long-term heat removal systems.

Calculation

The indicator is determined using the values reported for the previous 12 quarters as follows:

value = total number of unplanned reactor shutdowns while critical at or above the point of adding heat during the previous 12 quarters that were caused by or involved an unplanned loss of the normal heat removal path prior to establishing reactor conditions that allow use of the plant's normal long-term heat removal systems

Definition of Terms

Normal heat removal path: The normal heat removal path, for the purposes of this indicator, consists of the path from the main condenser through the main feedwater system to the steam generators (PWRs) or reactor vessel (BWRs), then through the main steam isolation valves, the turbine bypass valves, and back to the condenser.

Loss of the normal heat removal path: Decay heat cannot be removed through the main condenser when any of the following conditions occur (see clarifying notes below):

- complete loss of all main feedwater flow
- complete loss of condenser vacuum

- complete closure of at least one MSIV in each main steam line
- failure of one or more turbine bypass valves to maintain reactor pressure and temperature at the desired operating condition

Complete loss of condenser vacuum: A loss of condenser vacuum that prevents the condenser from removing decay heat after an unplanned reactor shutdown.

Unplanned reactor shutdown: The shutdown of the reactor in response to off-normal conditions or events by the unplanned addition of negative reactivity by any means (e.g., insertion of control rods, boron, or opening reactor trip breakers). Unplanned reactor shutdowns are those that bring the reactor from criticality to a shutdown mode within 15 minutes of commencing to insert negative reactivity.

Criticality: For the purposes of this indicator, criticality typically exists when a licensed reactor operator declares the reactor critical.

Clarifying Notes

Unplanned reactor shutdowns with loss of normal heat removal can occur in two ways: (1) The loss of the normal heat removal path causes the unplanned shutdown or (2) the loss of the normal heat removal path occurs after the unplanned shutdown. In either case, the normal heat removal path is considered unavailable. The determining factor for this indicator is whether or not the normal heat removal path is *available*, not whether the operators choose to use that path or some other path.

Operator actions or design features to control the reactor cooldown rate or water level, such as closing the main feedwater valves or closing all MSIVs (as long as the feedwater valves or MSIVs are capable of being reopened by operator demand) are not included. However, operator actions to mitigate the event (e.g., closing MSIVs to isolate a steam leak) are included.

Examples of a complete loss of all main feedwater flow: Trip of the only operating feedwater pump while operating at reduced power; loss of a startup or an auxiliary feedwater pump normally used during plant startup; loss of all operating feed pumps because of trips caused by low suction pressure, loss of seal water, or high water level (BWR reactor level or PWR steam generator level); unplanned reactor shutdown caused by the loss of all operating feed pumps; unplanned reactor shutdown in response to feed problems characteristic of a total loss of feedwater flow; and inadvertent isolation or closure of all feedwater control valves prior to an unplanned reactor shutdown.

Examples of loss of condenser vacuum: trip of all circulating water pumps; traveling screen blockage; condenser leakage; trip of all condensate pumps on high condensate temperature caused by the loss of condenser vacuum.

Examples of complete closure of at least one MSIV in each main steam line: automatic closure of all MSIVs as part of an engineered safety feature actuation; spurious closure of all MSIVs.

Example of loss of turbine bypass capability: sustained use of one or more atmospheric dump valves (PWRs) or safety relief valves to the suppression pool (BWRs) after an unplanned reactor shutdown.

Examples that do not count: loss of all main feedwater flow, condenser vacuum, or turbine bypass capability caused by loss of offsite power; partial losses of condenser vacuum or turbine bypass capability after an unplanned reactor shutdown in which sufficient capability remains to remove decay heat; momentary operation of PORVs or safety relief valves; and an unplanned shutdown at low power within the capability of the PORVs if the main condenser has not yet been placed in service or has been removed from service.

LIST OF RECENTLY ISSUED
NRC REGULATORY ISSUE SUMMARIES

Regulatory Issue Summary No.	Subject	Date of Issuance	Issued to
2000-20	Advance Notice of Intent to Pursue License Renewal	10/ /00 Date pending	All holders of OLs for nuclear power reactors, except those licensees who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2000-19	Partial Release of Reactor Site for Unrestricted Use Before NRC Approval of the License Termination Plan	10/24/00	All holders of OLs for nuclear power reactors, including those licensees who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2000-18	Guidance on Managing Quality Assurance Records in Electronic Media	10/23/00	All holders of OLs for nuclear power plants, including licensees that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel. In addition, those materials licensees, including certificate holders and vendors, that are required to have an NRC approved quality assurance program.
2000-17	Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff	09/21/2000	All holders of OLs for nuclear power reactors

OL = Operating License
CP = Construction Permit