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THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT OPERATIONS MANUAL

TITLE: POST REACTOR SCRAM EVALUATION

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Post Reactor Scram Evaluation

PAP-1602

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Revision

SCOPE OF REVISION:

POST REACTOR SCRAM EVALUATION

1.0 PURPOSE

To ensure a thorough and systematic evaluation of plant scram data in order to properly diagnose the cause of reactor scrams, ascertain the proper functioning of safety-related and other important equipment prior to restart, and to make the determination that the plant can be restarted safely.

2.0 SCOPE

This procedure applies to all unscheduled Reactor Scrams at the Perry Nuclear Power Plant.

This procedure does not apply to Reactor Scrams that are the planned results of approved tests. This procedure does not address reportability requirements for Reactor Scrams. Reportability requirements are contained in PAP-0603.

3.0 RESPONSIBILITY

- 3.1 The Manager, Perry Plant Operations Department (PPOD) or his designated alternate, is responsible for authorizing the Shift Supervisor to restart the plant following a scram.
- 3.2 The General Supervising Engineer, Technical Section, is responsible for providing personnel to investigate a scram, providing input to the Manager, PPOD, regarding the decision to restart, and reviewing and submitting the Scram Evaluation Report.
- 3.3 The Shift Supervisor (SS), is responsible for classifying the scram and for making recommendations to the Manager, PPOD, for plant restart.
- 3.4 The Shift Technical Advisor (STA), is responsible for providing post scram data and preliminary evaluations of plant performance including whether equipment functioned as designed. He is also responsible for completing the initial investigation of the scram and for making a recommendation to the SS as to the classification of the scram.

- 3.5 The Plant Operations Review Committee (PORC) is responsible for reviewing all Scram Evaluation Reports and for recommending approval for restart after Type IV scrams.
- 3.6 Plant personnel involved with the reactor scram are responsible for providing the STA with objective comments that describe their observations of and/or participation in the reactor scram.
- 3.7 The In-house Operating Experience Review Program Coordinator is responsible for ensuring lessons learned from unscheduled reactor scrams are used to improve plant safety and reliability and to transfer in-house experience of generic interest to the industry.

4.0 REFERENCES

- 4.1 INPO Good Practice OP-211, Post-Trip Reviews.
- 4.2 NRC Generic Letter 83-28.
- 4.3 NUREG-1000, Generic Implications of ATWS Events at the Salem Nuclear Power Plant.
- 4.4 CNL-071, Reactor Scram.
- 4.5 PAP-0603, Technical Specification Reportable Occurrences.

5.0 DEFINITIONS

5.1 Type I Scrams

The cause of the scram is positively known and has been corrected; all safety-related and other important equipment functioned properly during the scram.

5.2 Type II Scrams

The cause of the scram is positively known and has been corrected; some safety-related and/or other important equipment did not function properly; however, either the malfunction has been corrected or does not prohibit a startup.

5.3 Type III Scrams

The cause of the scram is not positively known but is judged by the SS to be spurious and to have a reasonably low potential for recurrence. In addition, there is no indication that any safety-related or other important equipment functioned in an abnormal manner during the scram.

5.4 Type IV Scrams

The cause of the scram is not positively known.

and/or

Some safety-related or other important equipment functioned in an abnormal or degraded manner during the scram and the malfunction has not been corrected.

5.5 Scram

A Reactor Protection System actuation that results in the deenergization of scram pilot solenoid valves, insertion of control rods, energization of the backup scram pilot solenoid valves, and the isolation of the scram discharge volume.

6.0 DETAILS

6.1 General

The post-scram evaluation process is a 6-step process consisting of the following:

<u>Step</u>	<u>Responsibility</u>
1. Data Collection	STA
2. Initial investigation and recommended scram classification	STA
3. Scram Classification	Shift Supervisor
4. Restart decision	Manager, PPOD or designated alternate
5. Scram investigation review	GSE, Technical Section and PORC

6. Lessons learned,
Follow-up actions

In-house operating experience
review program coordinator.

The overall objective of the evaluation is to determine the acceptability of performing a reactor restart. The Post Scram Evaluation Report (Attachment 1), guides and documents the scram review process. Any unscheduled reactor scram will require a post scram evaluation process to be initiated. The post scram evaluation shall be initiated after plant conditions have stabilized. This evaluation shall not distract the Shift Supervisor, operating personnel, or the STA from their primary responsibility of monitoring plant parameters and maintaining the plant in a safe condition.

6.2 Data Collection

The purpose of the data collection phase of the post scram evaluation is to gather sufficient data to reconstruct the transient from prior to the initiating signal until plant parameters have stabilized.

- 6.2.1 The STA will complete Sections I and II of Attachment 1 and will also collect the required information listed in Section V. Stripchart recordings must accurately reflect real time to have meaningful information. If necessary, annotate the chart paper with a time mark, chart speed, and time scale. The STA is responsible for ensuring that all data required in Sections I, II and V is accurate and is collected in a timely manner. The quality of the scram investigation and restart decision is dependent upon the collected data.
- 6.2.2 Individuals involved in the scram, as determined by the STA, will provide the STA with a written statement of their involvement by filling out a Personnel Statement, Attachment 2. These statements shall be written to include:
1. Plant conditions prior to the trip.
 2. First indication that a problem existed.
 3. Individual's actions as a result of the indications.
 4. Subsequent indications and plant response including manual actions.
 5. Noted equipment malfunctions or inadequacies.
 6. Procedure deficiencies noted during the incident.

In some cases, it may be appropriate for the STA to interview personnel or to conduct a critique with all personnel involved in the scram. If either of these techniques are used, the type of information listed above should be obtained.

6.3 Post-Scram Investigation

The STA is responsible for the initial post-scram investigation. The purpose of this investigation is to determine the cause of the scram and to assess the plant's readiness to return to operation.

6.3.1 The STA will reconstruct the transient using the collected data. A chronological description of the transient will be developed in Section III of Attachment 1 using the Sequence-of-Events (SER) printout as a base. This chronological description will include pertinent alarms, trips, actuations (manual and automatic), and isolations and will incorporate plant parameters for clarification. If the SER printout is not available, note this fact in Section III and reconstruct the transient using available data.

6.3.2 If possible, compare the reconstruction of events with similar transients described in the Final Safety Analysis Report or previous data packages for similar trips. This will assist in identifying abnormal or degraded indications. The transient reconstruction shall also be compared with the required procedure actions to determine the affect of the procedure actions on the plant response.

6.3.3 The STA shall analyze and evaluate the event reconstruction and event comparison to determine the cause of the scram and the following:

1. if all safety-related and other important equipment involved in the scram operated as anticipated or expected.
2. if the scram/transient caused any detrimental effects on plant equipment.
3. if any problems affect the other unit.
4. if it is acceptable to restart the Reactor.

The STA shall also review the available information for 1) abnormal indications or degraded trends in equipment performance, 2) events occurring out of the normal or anticipated sequence, 3) failed or degraded response of equipment to control signals, 4) unusual chemistry results or radiation readings, and 5) unanticipated alarms. The STA will complete Section IV of Attachment 1.

- 6.3.4 The STA will perform a Preliminary Safety Assessment of the scram and subsequent plant response. Examine the maximum and minimum values of critical plant parameters indicated in Section V of Attachment 1. Compare these values with Technical Specification values. Document this Safety Assessment by completing Section V of Attachment 1.
- 6.3.5 Based on the results of the analysis and evaluation of the plant scram and subsequent response the STA will recommend a classification of the event as a Type I, II, III, or IV Scram.
- 6.3.6 The STA will complete the cover sheet for the Post-Scram Evaluation Report. All Scram Reports will be numbered as follows:

U-YY-NN

└── is a sequential number starting at 01 each year
└── is the year
└── is the unit number

The STA will maintain a log of the Scram Numbers. The STA will review the Scram Evaluation Report and sign the cover sheet.

- 6.3.7 The Shift Supervisor will review the Scram Evaluation Report, classify the scram and sign the cover sheet.
- 6.3.8 For Type I, Type II or Type III scrams, the SS may recommend to the Manager, PPOD, that the reactor restart be initiated. For Type IV scrams, the restart will be postponed until further investigation is performed.
- 6.3.9 The SS will forward the Evaluation Report to the GSE, Technical Section for review.

6.4 Restart Decision

- 6.4.1 The Manager, PPOD (or designated alternate) will authorize the unit startup considering the following:
- The cause of the trip is known and corrected, and
 - Safety-related and other important equipment functioned properly during the transient, or corrective maintenance and satisfactory testing has been performed or will be completed when plant conditions permit, and
 - The plant response during the transient has been analyzed and the plant responded as anticipated, or all abnormalities are understood and corrected as required by Technical Specifications.

If the cause of the Scram has not been positively identified, the Manager, PPOD, shall determine if the cause and the circumstances surrounding the cause have been analyzed adequately. Type IV Scrams must be reviewed by PORC prior to a restart decision being reached.

6.5 Post-Scram Evaluation Report Review

6.5.1 The GSE, Technical Section, will review the Post-Scram Evaluation Report for the following:

1. Ensure that the cause of the scram has been correctly identified.
2. Ensure that equipment and systems functioned as designed during the transient scram recovery actions.
3. Evaluate the data in the Evaluation Report to determine if there are any additional corrective actions required prior to startup of the unit.

6.5.2 Upon completion of his review of the Post-Scram Evaluation Report, the GSE, Technical Section, will sign and date the cover sheet and forward the report to PORC for review.

6.5.3 PORC will review the Post-Scram Evaluation Report to identify any underlying or generic problems and also review, prior to restart, Type IV Scram Evaluation Reports and will recommend a course of action to the Manager, PPOD, for recovering the plant. PORC will evaluate the Scram to determine if additional corrective actions (procedure changes, design modifications, training requirements, etc.) need to be implemented.

6.6 In-House Operating Experience Review

6.6.1 A copy of the Scram Evaluation Report will be sent to the In-House Operating Experience Review Coordinator so that corrective actions and lessons-learned will be identified to prevent reoccurrence. He will evaluate the Scram to determine the need for dissemination of lessons learned to the rest of the industry.

6.7 Records

6.7.1 The Post-Scram Evaluation Report and its Attachments will be retained for the life of the plant.

6.7.2 A copy of the Scram Evaluation Report shall be sent to the Training Section General Supervisor.

7.0 ATTACHMENTS

- 7.1 Attachment 1 - Form: PAP-1602-1 (Sheets a-g), Post-Scram Evaluation Report.
- 7.2 Attachment 2 - Form: PAP-1602-2, Personnel Statement.

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Attachment 1
Form: PAP-1602-1a
Sheets a-g

Post-Scram Evaluation Report

PERRY NUCLEAR POWER PLANT

Unit _____ Scram No. _____ Date/Time of Scram: _____ / _____

Scram Classification: Type _____ Scram _____

Cause of Scram: _____

Manager, PFOD, notified and permission granted for restart (Type I, II, and III scrams only)

Shift Supervisor _____ Date/Time _____

Shift Supervisor: _____ Date: _____

Shift Technical Advisor: _____ Date: _____

GSE, Technical Section: _____ Date: _____

PORC Meeting No.: _____ Date: _____

Post-Scram Evaluation Report

I. Pre-Scram Plant Conditions

1. Reactor: Critical _____ Subcritical _____
2. Power Level: _____ (% cps, or range and value)
3. Mode Switch: Run _____ Startup/Stby _____ Refuel _____
4. Turbine Generator: Synchronized _____
Load _____ MWe Shutdown _____
5. Recirculation:
_____ 15 Hz _____ 60 Hz _____ Master Auto
_____ Master Manual _____ Flux Manual
_____ Loop Manual _____ FCV Position
6. Evolutions/Testing in Progress:

7. Off-Normal Status of Safety Systems:

II. Scram Conditions

	<u>Prescram</u>	<u>Scram</u>	<u>Post-Scram</u>
1. Main Steam Flow	_____ %	_____ %	_____ %
2. Feedwater Flow	_____ %	_____ %	_____ %
3. Total Flow (Recirc.)	_____ %	_____ %	_____ %

Attachment 1 (Cont.)
Form: PAP-1602-1c

	<u>Prescram</u>		<u>Scram</u>		<u>Post-Scram</u>	
	<u>PSID</u>		<u>PSID</u>		<u>PSID</u>	
	<u>WR</u>	<u>NR</u>	<u>WR</u>	<u>NR</u>	<u>WR</u>	<u>NR</u>
4. Core P						
5. RPV Level		<u>IN</u>		<u>IN</u>		<u>IN</u>
6. RPV Pressure		<u>PSIG</u>		<u>PSIG</u>		<u>PSIG</u>
7. Rx Power		<u>%</u>		<u>%</u>		<u>%</u>
8. Off-Gas Pretreatment Rad Level						
9. Containment Pressure		<u>PSIG</u>		<u>PSIG</u>		<u>PSIG</u>
10. Suppression Pool Temperature		<u>°F</u>		<u>°F</u>		<u>°F</u>

II. Plant Response

A. Safety System Actuation and Performance

1. Isolations:

Type

Cause

Time

2. ECCS Actuations:

B. Obtain the hard-copy data listed in Section VI, Attachments.

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Attachment 1 (Cont.)
Form: PAP-1602-1d

III.

Chronological Description

Composed By: _____ SRO: _____

STA: _____

Page ____ of ____

Time

Event Description

IV. Analysis and Evaluation

A. Probable cause of the scram:

Comments:

B. Unexpected Aspects of Transient. Note previous similar transients to compare with.

C. Identification of Systems with Inadequate Performance

System/Component	Description of Problem
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

V. Preliminary Safety Assessment

A. List values of the parameters indicated below:

	Min.	Max.	T.S. Limit
a. Steam Dome Pressure	—	— psig	≤ 1325 psig
b. Reactor Vessel Water Level	—	— IN	TOF
c. Core thermal power vs. Steam Dome Pressure	—	—	$\leq 25\%$ power with pressure < 785 psig $\leq 25\%$ power with flow $< 10\%$
d. Minimum Critical Power Ratio (MCPR) (Prior to the Scram)	—		See Tech Spec Figs. 3.2.2-1 & 3.2.2-2
e. Reactor coolant system heatup/Cooldown rates		— °F/hr	$\leq 100^\circ\text{F/hr.}$
f. Containment Temperature		— °F	$\leq 90^\circ$
g. Suppression Pool Temperature		— °F	$\leq 95^\circ$
h. Drywell Temperature		— °F	$\leq 135^\circ$
i. Drywell to Containment		— psid	- 1.5 to + 2.1 psid
j. Comments:	<hr/> <hr/>		

VI. Attachments

1. Copy of the Unit Log from past 24 hours.
2. Recorder charts for the following:
 - a. APRM
IRM
SRM
 - b. Reactor Vessel Level, Upset and Wide Range
 - c. Core flow

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Attachment 1 (Cont.)
Form: PAP-1602-1g

- d. Reactor Pressure, Wide and Narrow Range
 - e. Feedwater Flow
 - f. Steam Flow
 - g. Drywell Pressure
- 3. Post Trip Log
 - 4. SER Log
 - 5. ERIS Sequence of Events Log
 - 6. Last PI prior to the scram
 - 7. Personnel Statements, Form: PAP-1602-2

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Attachment 2
Form: PAP-1602-2

Personnel Statement

Prepare a handwritten statement describing the scram event sequence and plant response as you remember it. Include the plant conditions prior to the scram, your indications that a problem existed, your actions as a result of those indications, noted equipment malfunctions or inadequacies, and any identified procedure deficiencies. Also include any information you consider important to review this unscheduled reactor scram.

(Use additional sheets if necessary)

Signature

Date

Time

Position: _____ No. of attached pages _____

PAP16/C/amh