Appendix D-1:
Senior Reactor Analyst Training and Qualification Program

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Introduction

The Senior Reactor Analyst (SRA) Training and Qualification Program is an advanced study leading to certification as SRA. Individuals must complete the formal training courses, the individual study activities (ISAs), the on-the-job activities (OJTs), and the required rotations prior to certification unless certain of these activities are exempted due to prior experience and or training. Upon completion of the required program elements, an SRA Qualification Board must be convened to verify that the qualifying individual has gained an acceptable level of knowledge and experience to be certified as SRA.

It is expected that individuals entering the SRA program will have extensive reactor inspection experience and be currently qualified or previously qualified reactor inspectors. If the individual is not a qualified reactor inspector, inspector qualification may be worked in parallel with SRA qualification activities but emphasis should be placed on qualifying as an inspector initially. In all cases, SRAs must qualify and remain qualified as an NRC Reactor Operations Inspector.

Being selected as SRA involves a temporary promotion to GG-15. Individuals selected as SRA must complete the training within two years of the GG-15 temporary promotion date. If an individual does not complete the rotational and training requirements set forth in this Appendix within two years, the temporary promotion may be revoked. Extension of the two year period is allowed but the extension must be coordinated and approved by the individual's management. In addition, the Office of Human Resources must be notified of the extension.

Qualification Board

The SRA Qualification Board will consist of a minimum of three members, two of which will be currently qualified and active SRAs. The board chairman will be a Division Director or higher in the region and a Branch Chief or higher in NRR. The board chairman cannot be the individual's immediate supervisor. Whenever practical, the individual's immediate supervisor is encouraged to observe the board proceedings.

The qualifying individual should submit a package to the Qualification Board members documenting the work completed during the training and qualification program. Upon review of the completed work, the Qualification Board chairman may provide specific direction to the individual of any actions needed to prepare for the board appearance. It is the responsibility of the qualifying individual and his or her management to select board members and to schedule the board.

Board members will review significant work products completed during the training and developmental activities. The purpose of this review is to inform the board on the extent and depth of the analytical work the individual performed and to provide the board the opportunity to explore the benefits gained from those activities. Once the qualifying individual has completed the board review, the board chairman will initiate a memorandum to the individual's management informing them of the results. In the event an individual is determined by the board to lack knowledge in a particular area(s), the board should develop a remedial strategy to address the area(s) of concern.

Prerequisites

Individuals should complete either the PWR or BWR technology full series prior to taking the required PRA training courses. For individuals who are not qualified reactor inspectors, basic inspector qualification should be completed prior to taking any of the PRA related training courses.

To the extent possible, the following ISAs should be completed prior to beginning the PRA course work.

ISA-SRA-A	Building Your SRA Reference Library (proposed)
ISA-SRA-B	PRA Principles and Regulatory Guidance for SRAs
ISA-SRA-C	Review of Historical NRC Severe Accident Risk Evaluations and the Methodologies Used in the Analyses
ISA-SRA-D	Understanding How Full Scope PRA Models Were Developed

All ISAs associated with OJT activities must be completed before the OJT is performed.

Required Training Courses

The required course work may be completed in parallel with ISA-SRA-1 through ISA-SRA-14. In the event an individual is entering the SRA training and qualification program but has already completed all or a portion of the courses listed below, an assessment should be performed by the individual and his or her management to determine if any previously completed courses need to be retaken or reviewed due to an excessive length of time (i.e., more than three years) since the courses were taken. This assessment should be documented and included within the individual's readiness for SRA certification. The required courses are listed below.

1. Probability and Statistics for PRA Course (P-102)
2. System Modeling Techniques Course for PRA (P-200)
3. Human Reliability Assessment Course (P-203)
4. Risk Assessment in Event Evaluation Course (P-302)
5. PRA Technology and Regulatory Perspective (P-111)
6. SAPHIRE Course (P-201)
7. Advanced SAPHIRE Course (P-202)
8. External Events (P-204)
9. Accident Progression Analysis (P-300) or Reactor Safety (R-800)

Required Rotational Assignments

The SRA training and qualification program requires one two-month rotation to a regional office and one two-month rotation to the PRA Operational Support and Maintenance Branch (APOB) of NRR. To the extent possible, these rotations should be accomplished over eight consecutive weeks each with minimal interruption and be scheduled after the individual has completed the required course work. During the rotations, qualifying individuals are encouraged to work on issues specific to the needs of the rotational assignment. Individuals should not work on assignments that are not specific to meeting the objectives of the rotation. The regional rotation may not be to the individual's home

region, if applicable, and the selection of the particular region must be coordinated with regional management. When selecting which region for the rotation, consideration should be given to the overall needs of the NRC and as much as possible and the selection of the rotations should be evenly distributed among all regions between qualifying SRAs. At the conclusion of each rotation, performance appraisal feedback should be forwarded to the individual's supervision. The rotation to APOB does not apply to SRAs assigned to that branch.

Required Refresher Training

The Advanced Risk Assessment Topics course and either the BWR or PWR refresher training shall be completed every three years. It is recommended that inspector certification for SRAs be alternated between PWR and BWR technologies. When taking the refresher courses, it is also recommended that the simulator and technology review courses be scheduled as close together as possible. Other training needs should be evaluated based on the needs of the individual. For example, although a qualified SRA had previously received training on SAPHIRE, it may be appropriate to retake the course, assuming the SAPHIRE code had changed sufficiently to warrant the need for additional training. In addition, qualified SRAs should seek training opportunities that may be offered via the NRC Form 368 process.

SRAs are encouraged to attend a professional meeting at least every three years. The meetings may be either NRC or industry sponsored and should address PRA applications or specific aspects of PRA (e.g., human reliability assessment, common cause failure analysis, fault tree/event tree modeling, risk communications, etc.,) that are of interest to the SRA and important for continued development in the SRA's understanding of risk technology.

Equivalency Justification

Equivalency justification for the regional rotation is not permitted. Other program requirements including the APOB rotation, individual study activities, formal course work, and on-the-job training activities are assessed on a case-by-case basis. When approving an equivalency justification, careful consideration should be given to the length of time that has passed since the individual has previously completed the training or the experience gained from previous work history.

Review of Completed Training

Individual study activities, on-the-job activities, and rotational assignments must be discussed with a qualified SRA designated by the individual's supervisor. It is recommended that the qualifying individual determine who will be the reviewer of completed work as early in the qualification process as possible.

Documentation

Documentation of completed training is recorded on the Signature and Certification Card Form. Equivalency justification for formal training courses, individual study activities, and on-the-job activities is recorded on the Equivalency Justification Form.

Qualifying individuals are encouraged to maintain records of specific tasks (e.g., completion of a Phase 3 analysis) performed that are required by the ISAs or OJTs. This documentation may prove beneficial when the individual is preparing for the qualification board.

Sequence for SRA Qualification Program

Prerequisites

Complete the following ISAs:

ISA-SRA-A Building Your SRA Reference Library (proposed)
ISA-SRA-B PRA Principles and Review of NRC Approach to Risk-Informed and Performance-Based Regulation
ISA-SRA-C Review of Historical NRC Severe Accident Risk Evaluations and the Methodologies used in the Analyses
ISA-SRA-D Understanding How Full Scope PRA Models Were Developed

Course work and ISAs can be completed concurrently provided all prerequisites have been met. On-the-job tasks must be completed during NRR/APOB or Regional Office Rotations.

Courses

Full Series - Both BWR and PWR
P-102 Probability and Statistics
P-200 Modeling Techniques
P-203 Human Reliability Analysis
P-302 Risk Assessment in Event Evaluation
P-111 PRA Technology and Regulatory Perspective
P-201 SAPHIRE
P-202 Advanced SAPHIRE
P-204 External Events
P-300 Accident Progression Analysis or R-800 Perspectives on Reactor Safety

Individual Study Activities

(ISA-SRA-1) Significance Determination Process and Its Basis
(ISA-SRA-2) Limitations of Licensee PRAs
(ISA-SRA-3) PRA Quality Initiative
(ISA-SRA-4) IPEEE Lessons Learned
(ISA-SRA-5) Understanding How EPRI Documents are Used by Licensees
(ISA-SRA-6) Overview of Shutdown Risk
(ISA-SRA-7) Emergency Operating Procedure Guidance
(ISA-SRA-8) Management Directive 8.3, "NRC Incident Investigation Program"
(ISA-SRA-9) Understanding the Development of Accident Sequence Precursor (ASP) Results
(ISA-SRA-10) The Role of the SRA in the NOED Process
(ISA-SRA-11) System Reliability Studies
(ISA-SRA-12) Conducting a Phase 3 Analysis
(ISA-SRA-13) The Role of the SRA in Inspection Planning (proposed)
(ISA-SRA-14) Large Early Release Frequency (LERF) (proposed)

Rotations

ROT-SRA-1 Rotation to NRR/APOB
ROT-SRA-2 Rotation to Regional Office

On-the-Job Tasks

OJT-SRA-1 Perform an Independent Review of a SDP/Enforcement Review Panel (SERP) Package
OJT-SRA-2 Conduct a Phase 3 Analysis
Rotational Assignment to Regional Office
OJT-SRA-3 MD 8.3, "NRC Incident Investigation Program
OJT-SRA-4 Perform a NOED Risk Review

Qualification Board
Full SRA Qualification

Senior Reactor Analyst Individual Study Activities

SRA Individual Study Activity

TOPIC: (ISA-SRA-A) Building Your SRA Reference Library (proposed)

Under development

SRA Individual Study Activity

TOPIC: (ISA-SRA-B) PRA Principles and Review of NRC Approach to Risk-Informed and Performance-Based Regulation

PURPOSE: An SRA is expected to have a general knowledge of the topics addressed in the references. For the documents identified as skim only, the SRA is required to have knowledge of the general content of these documents (i.e. for use as reference documents).

SRAs must understand the risk terminologies and philosophies used by the NRC in the conduct of its regulatory activities. It is essential that an SRA be conversant with the common terms of risk communication and have a basic understanding of the NRC's approach to how risk should be integrated into the regulatory process.

COMPETENCY AREA: REGULATORY FRAMEWORK
TECHNICAL AREA EXPERTISE

LEVEL OF EFFORT: 80 hours

REFERENCES: See list at end of this activity.

EVALUATION CRITERIA: Application of the specific regulatory guidance references should be studied or reviewed to the extent required to satisfactorily address each of these evaluation criteria. You will demonstrate your understanding of the content of the reference documents by successfully addressing each of the evaluation criteria.

1. Discuss the Quantitative Health Objectives (formerly known as probabilistic safety goals)

2. Discuss differences in deterministic and probabilistic approaches to regulation and nuclear safety.

3. Define terms that are used in both risk-informed and deterministic approaches to regulation.

4. Explain how risk-informed and defense-in-depth approaches can be integrated in a coherent manner.

5. Explain the difference between prescriptive and performance-based regulation.

6. Discuss the advantages of a risk-informed, performance-based approach to regulatory decision-making.

7. Discuss the Commission Policy statement regarding expanding the use of PRA in regulatory matters in support of defense in depth and traditional engineering, to reduce unnecessary conservatism, support additional regulatory requirements, assist in regulatory decision making, and consider uncertainties in regulatory decisions.

8. Discuss the scope of Level 1, 2, 3 PRAs. Explain the purposes of IPEs and IPEEEs.

9. Discuss why PRA may not be used in determining operability of a Structure, System, or Component (SSC).

10. Discuss the principles of RG 1.174 and its application to risk-informed decision-making.

11. Discuss the risk metrics (e.g., CCDP, ICCDP, delta CDF, etc., as they relate to the various applications (e.g., maintenance rule, event assessment, SDP, etc.) of PRA in the Reactor Oversight Process.

TASKS:

1. Review the references listed for this activity.

2. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: SRA Proficiency Level Qualification Signature Card Item ISA-SRA-B

REFERENCES FOR ISA-SRA-B

CATEGORY A: Documents for which detailed knowledge is required

Regulatory Guides

RG-1.160 "Monitoring the Effectiveness of Maintenance in Nuclear Power Plants"

RG-1.174 "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions of Plant-Specific Changes to the Licensing Basis"

RG-1.182 "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants"

RG-1.200 "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities"

NUREGS

NUREG-1449 "Shutdown and Low Power Operations at Commercial Power Plants"

NUREG-1605 "Risk Profile Methodology of Plant Configurations and Pilot Applications Lessons Learned"

NUREG-1765 "Basis Document for Large Early Release Frequency (LERF) and the Significance Determination Process (SDP)"

NUREG/CR-5485 "Guidelines on Modeling Common Cause Failures in Probabilistic Assessment"

NUREG/CR-5750 "Rates of Initiating Events at U.S. Nuclear Power Plants: 1987-1995"

NRC Generic Letters

GL 88-20 & supplements "Individual Plant Examination For Severe Accident Vulnerabilities"

Federal Register Notices

Federal Register, 8/21/86, "Safety Goals for the Operations of Nuclear Power Plants: Policy Statement"

Federal Register, 8/8/85, "Policy Statement on Severe Reactor Accidents regarding Future Designs and Existing Plants"

Federal Register, 8/16/95 "Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities: Final Policy Statement"

Other Documents

Staff Requirements Memo for SECY 98-144, “White Paper on Risk-Informed and Performance-Based Regulation (Revised)”

Idaho National Engineering and Environmental Laboratory (INEEL/EXT-99-00041, January 1999) “Revision of the 1994 ASP HRA Methodology (Draft)"

REFERENCES FOR ISA-SRA-B (CONTINUED)

CATEGORY B: Documents for which a general knowledge is required.

Regulatory Guides

RG-1.175 "An Approach for Plant-Specific, Risk-Informed Decision making: Inservice Testing"

RG-1.176 "An Approach for Plant-Specific, Risk-Informed Decision making: Graded Quality Assurance"

RG-1.177 "An Approach for Plant-Specific, Risk-Informed Decision making: Technical Specifications"

RG-1.178 "An Approach for Plant-Specific, Risk-Informed Decision making: Inservice Inspection"

NUREGS

NUREG-75/014 "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants - Main Report (WASH 1400)"

NUREG-0492 "Fault Tree Handbook"

NUREG-1032 "Evaluation of Station Blackout Accidents at Nuclear Power Plants"

NUREG-1150 "U.S. Nuclear Regulatory Commission, Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants"

NUREG 1407 "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities"

NUREG-1560 "IPE Program: Perspectives on Reactor Safety and Plant Performance"

NUREG-1570 "Risk Assessment of Severe Accident Induced Steam Generator Tube Rupture"

NUREG-1742 "Perspectives Gained from the IPEEE Program, Volumes 1 and 2"

NUREG/CR-4334 "An approach to the Quantification of Seismic Margins in Nuclear Power Plants."

NUREG/CR-4482 "Recommendations to the Nuclear Regulatory Commission on Trial Guidelines for Seismic Margin Reviews of Nuclear Power Plants"

NUREG/CR-4550 "Analysis of Core Damage Frequency: Internal Events Methodology

NUREG/CR-6141 "Handbook of Methods for Risk Based Analyses of Technical Specifications"

NUREG-6265 "Multidisciplinary Framework for HRS with an Application of Errors of Commission and Dependencies"

NUREG/CR-6544 "A Methodology for Analyzing Precursors to Earthquake - Initiated and Fire-Initiated Accident Sequences"

NUREG/CR 6595 "An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events"

NUREG/CR-6823 "Handbook of Parameter Estimation for Probabilistic Risk Assessment"

NRC Information Notices

IN 2000-13 "Review of Refueling Outage Risks"

Other Documents

EPRI TR-105396 "PSA Application Guide"

National Research Council - "Understanding Risk-Informing Decisions in a Democratic Society"

SRA Individual Study Activity

TOPIC: (ISA-SRA-C) Review of Historical NRC Severe Accident Risk Evaluations and the Methodologies Used in the Analyses

PURPOSE: An SRA routinely conducts risk assessments using many different models and evaluation techniques. The purpose of this activity is to familiarize you with the methodologies and techniques used in developing NUREG-1150 and with the relative risks indicated for each of the reactor/containment types evaluated during the NUREG-1150 assessment.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. NUREG-1150, Volume 1, "Reactor Risk Reference Document"
2. NUREG-1150, Volume 2, "Severe Accident Risks: An Assessment for Five U. S. Nuclear Power Plants"
3. NUREG/CR-4550, "Analysis of Core Damage Frequency: Internal Events Methodology"

EVALUATION CRITERIA:

1. Demonstrate a general knowledge of the Accident Sequence Evaluation Program methodology described in NUREG/CR-4550 by discussing the purpose and approach to completing each of the 12 tasks defined in the methodology.
2. Provide examples of risk insights provided by the NUREG-1150 assessment.
3. Distinguish between the reactor/containment types and the NUREG-1150 results for each type.

TASKS:

1. Review Figures A.1 through A.4 and associated text in NUREG-1150, Volume 2, Appendix A to gain a general overview of the methodology.
2. Read and understand the Executive Summary and Section 1.2 of NUREG/CR-4550.

3. Review and interpret each of the acronyms and initialisms used in the Task 2 reading.

4. Read the executive summary of NUREG-1150.

5. Skim the analysis results for each of the plants (reactor/containment type). Pay particular attention to the risk insights gained and the differences between the types.

6. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-C

SRA Individual Study Activity

TOPIC: (ISA-SRA-D) Understanding How Full Scope PRA Models Were Developed

PURPOSE: This activity will introduce you to the licensee's full scope internal events PRA. As the licensee's risk evaluation program, it is important to understand the licensee's PRA and a how it was developed and actions taken to maintain a "living" PRA. Although level 3 PRA studies are included within a full scope PRA, few level 3 PRA models exist. Therefore, this area of PRA should be familiar to SRAs but not emphasized.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. ASME RA-S-2002, April 5, 2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications"

2. Regulatory Guide DG-1.200, December 2003, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities"

3. Licensee-specific PRA for review.

4. NUMARC 93-01, Revision 3, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" Appendix E, Rev. 3, July 2000, "PSA Attributes."

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Describe the basis of the PRA.

2. Describe the elements of a full scope PRA.

3. Be familiar with the content and format of an PRA.

4. Compare a PRA to Standardized Plant Analysis Risk (SPAR) model documentation using the plant specific notebooks produced by Idaho Environmental and Engineering Laboratory (INEEL).

TASKS:

1. Review a full scope PRA and compare with a plant specific SPAR model.

   Select an appropriate full scope PRA and perform a review consistent with that described in Reference 1 and 2. The student should be familiar with all sections of the PRA, paying particular to the following areas:

   -Overall results and insights
   - Success criteria analysis
   - System analysis
   - Initiating event analysis
   - Human reliability analysis
   - Parameter estimation analysis
   - Interpretation of results

2. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-D

SRA Individual Study Activity

TOPIC: (ISA-SRA-1) Significance Determination Process and Its Basis

PURPOSE: An SRA is expected to be an agency expert on the Significance Determination Process (SDP), particularly in the Reactor Safety Strategic Performance area. SRAs should also be familiar with SDPs for Radiation Safety and Physical Security.

COMPENTENCY AREA:
REGULATORY FRAMEWORK
TECHNICAL AREA EXPERTISE

LEVEL OF EFFORT: 80 hours in office review (additional time needed for specific tasks)

REFERENCES:

1. IMC-609, "Significance Determination Process" and associated appendices

2. IMC-308, "Reactor Oversight Process (ROP) Basis Document"

3. IMC-609.01, "Significance and Enforcement Review Process"

4. IMC-609.03, "Senior Reactor Analyst Support Objectives"

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Explain the role of the SRA in the SDP process, particularly in the development of inspection findings in Phases 1, 2 and 3 of the process. Explain the purpose of the SDP for achieving a "best estimate" of risk using best available information.

2. Explain the concept of concurrent inspection findings and be able to explain the basis for treatment of concurrent findings.

3. Describe the SERP process. Explain the role of the SRA in preliminary and final significance determinations.

4. Understand, explain and implement the risk-informed decision attributes that meet the minimum acceptable standards for the ROP (Refer to IMC 609.01, Exhibit 4).

5. Compare and contrast the assessment of inspection findings versus the assessment of operational events or degraded conditions paying particular attention to the various risk metrics used (i.e., CCDP, CLERP, delta CDF, etc.).

6. Have a detailed working knowledge of IMC-609, Appendices A, F, G, and H and be familiar with other Appendices (B, C, D, E, I, and J) that support the SDP process.

7. Understand the SDP Usage Rules in the SDP Phase 2 process in sufficient depth to be able to use the guidance and explain to a non-risk analyst.

8. Discuss the limitations of current PRA technology regarding assessment of external event contribution to inspection findings.

9. Explain why a change in the core damage frequency versus conditional core damage probability was selected as a measure for evaluating the significance of an inspection finding.

TASKS: Complete the following tasks:

1. Review the references for this activity. Thoroughly review IMC-609, "Significance Determination Process," including all attachments and appendices and IMC-308, "Reactor Oversight Process (ROP) Basis Document," Attachment 3.

2. Perform at least two SDP Phase 1 and 2 analyses using actual inspection findings. In the event two assessments are not available, review previously completed findings independently of documented results.

3. Assist a qualified SRA in at one training session of Phase 1 and 2 to inspectors or other qualifying individuals.

4. Assist inspectors during the planning phase of a team inspection by using a plant specific Phase 2 notebook to identify potential inspection samples.

5. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Checklist, Item ISA-SRA-1

SRA Individual Study Activity

TOPIC: (ISA-SRA-2) Limitations of Licensee PRAs

PURPOSE: Significance Determination Process Phase 3 evaluations require an SRA to review licensee PRA information for applicability for consideration in the analysis. Also, at regulatory conferences the licensee routinely provides information derived from their PRA. To confirm the results of a SDP Phase 2 a licensee's PRA can be used. The risk input for all NOEDs that are reviewed by a SRA are from the licensee's PRA. Without an understanding of the licensee's PRA, it would be difficult for an SRA to make an informed judgement as to whether to include or reject the licensee's information.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 24 hours

REFERENCES:

1. Licensee's Event Trees from PRA
2. Licensee's Fault Trees from PRA
3. Licensee's Dominant Cutsets (top 25 per initiating event and top 100 total)
4. Same information from SPAR model for that plant
5. Same information from another plant of similar design
6. P&IDs
7. Licensee System Descriptions

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Identify significant differences between PRAs of the same facility.

TASKS:

1. Select a particular system.
2. Read the system description
3. Compare the fault tree for that system to the P&ID to establish the logic is correct for the Top Gate, that all common

components between trains contain a common cause failure basic event and determine if any instrument failures can defeat a train and are included in the fault tree.

4. Compare Top Gate failure probability to that in SPAR and a companion facility. If off by a factor of 10, acquire cutsets for the Top Gate and compare to understand why there are differences.

5. Review Initiating Event frequencies against SPAR for deviations of a magnitude.

6. Review the Event Trees against SPAR and the other plant for any logic differences.

7. Review cutsets for selected accident sequences from the licensee's PRA, SPAR and the other plant. Understand what factor(s) make the results differ by an order magnitude, if any.

8. Understand how the licensee developed the RCP seal LOCA model (PWR) and the loss of all Service Water.

9. If possible, discuss identified differences with the licensee's PRA analyst.

10. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-2

SRA Individual Study Activity

TOPIC: (ISA-SRA-3) PRA Quality Initiative

PURPOSE: To familiarize the student with the industry standards for developing a quality PRA. Although each PRA is different, the PRA Quality Initiative will give the student an understanding of the basic structure of a PRA and the industry peer review process.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions of Plant-Specific Changes to the Licensing Basis"

2. ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications."

3. NEI 00-02, "Standard Peer Review Process for Internal Events PRAs"

4. Regulatory Guide, 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities"

5. USNRC, COMNJD-03-0002, "Stabilizing the PRA Quality Expectations and Requirements"

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Summarize the NRC position on PRA Quality as described in RG 1.174, section 2.5.

2. Describe the structure of a PRA as described in the ASME standard.

3. Identify the major components of the industry peer review process.

4. Describe the Commission's "phased approach" to address PRA quality issues.

TASKS:

1. Review RG 1.174 with emphasis on PRA quality.

2. Review ASME RA-S-2002. Pay specific attention to the High Level Requirements and scan the supporting requirements.

3. Review ASME RA-S-2002 and NEI 00-02 regarding the peer review process.

4. Review RG 1.200 to understand its relationship to other risk-informed guidance and the overall approach to improving PRA quality.

5. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-3

SRA Individual Study Activity

TOPIC: (ISA-SRA-4) IPEEE Lessons Learned

PURPOSE: Obtain a general knowledge of the methods used by licensees to produce each plant's IPEEE.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 8 hours

REFERENCES: NUREG-1742, Volumes 1 and 2, "Perspectives Gained From the IPEEE Program"

NOTE: These activities should be performed prior to taking the External Events Course (P-204).

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Discuss the methods used by the licensees in evaluating risk from fire, flood, high winds, and seismic events in the IPEEEs.

2. Discuss the potential problems with comparing risk numbers using the different approaches. Discuss how these problems can impact the Reactor Oversight Process and Management Directive 8.3 risk evaluations.

TASKS:

1. Read the main report of Reference 1 for a knowledge of the methods used and the limitations of the different approaches used by the licensees to produce the IPEEEs. Produce a table showing the different methods used for fire, flood, winds, and seismic events.

2. Be able to explain why adding the risk obtained from an external analysis to that obtained from an internal analysis may be appropriate within the ROP.

3. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-4

SRA Individual Study Activity

TOPIC: (ISA-SRA-5) Understanding How EPRI Documents are Used by Licensees

PURPOSE: Obtain a general knowledge of the programmatic guidance and specific software that EPRI provides to member utilities that is used to support risk related activities.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 24 hours (these activities may be easier to perform while on rotation to Headquarters)

REFERENCES:

1. EPRI TR-100370, "Fire Induced Vulnerability Evaluation (FIVE)"
2. EPRI TR-105928, "Fire PRA Implementation Guide"
3. EPRI TR-105396, "PSA Applications Guide"
4. NUREG/CR-6850, "EPRI/NRC-REF Fire PRA Methodology for Nuclear Power Facilities"

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Be able to discuss the uses for each of the following thermal hydraulic computer codes including:

   - RETRAN
   - CORETRAN
   - MAAP
   - GOTHIC

   Discuss potential limitations on their uses in risk applications (i.e. MAAP codes may be of limited use for analyzing conditions involving open systems or large leaks)

2. Demonstrate a general knowledge of FIVE by describing the steps involved in performing a FIVE evaluation. Discuss how a licensee might use Table 4.2 of Reference 2 in their fire study.

3. Explain, using Figures 4-1 and 4-2 of Reference 3, how components and conditions can be considered not risk significant for certain applications.

TASKS:

1. Discuss with a knowledgeable individual in the Plant Systems Branch of NRR the limitations of the computer codes (RETRAN, CORETRAN, MAAP, GOTHIC). Discuss the purpose and limitations on the licensee's use of each code. Determine which code is used to support which type of analysis in support of the PSA.

2. Obtain a copy of References 1 and 2. Read Sections 4 through 6 of Reference 1. Read for a general understanding of the FIVE process. Review the Table of Contents for a general knowledge of the content of the rest of the document. In Reference 2, read Sections 1, 2, and 3. Scan Section 4, paying attention to the Tables and Figures. Review the Table of Contents for a general knowledge of the content of the rest of the document.

3. Obtain a copy of Reference 3. Read sections ES, 1, 2,3, and 4. Obtain an understanding of the screening criteria used in Figures 4-1, and 4-2.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-5

Additional References

Other EPRI documents used by licensees for risk applications are:

1. EPRI TR-100443, " Methods of Quantitative Fire Hazard Analysis"

2. EPRI SU-105928, "Guidance for Development of Response to Request for Additional Information on Fire IPEEE"

3. EPRI TR-100380, "Pipe Failures in US Commercial Nuclear Power Plants"

SRA Individual Study Activity

TOPIC: (ISA-SRA-6) Overview of Shutdown Risk

PURPOSE: The purpose of this activity is to introduce the SRA to shutdown risk concepts, definitions, and key insights.

In SECY 97-168, based on a quantitative regulatory analysis, using PRA techniques , the staff concluded that the existing level of safety at shutdown is largely dependent upon voluntary measures by licensees. These voluntary measures are not traceable to specific underlying regulations and could be withdrawn by licensees without prior staff approval. In the SRM to SECY 97-168, the Commission directed the staff to "continue to monitor licensee performance, through inspections, and other means, in the area of shutdown operations to ensure that the current level of safety is maintained." In SECY 97-168, the annual risk of core damage from shutdown operations at PWRs and BWRs was reported to be comparable to at power risk.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. IMC 308, "Reactor Oversight Process Basis Document" Attachment 3, Appendix G, for the PWR and BWR Phase 2 Shutdown SDP templates

3. IMC 609, Appendix G, "Shutdown Operations Significance Determination Process," Attachments 1, 2, and 3.

4. Executive Summary (ONLY) of NUREG/CR-6143 Vol. 2, Part 1A, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Grand Gulf, Unit 1, Main Report (Sections 1-9).

5. Executive Summary (ONLY) of NUREG/CR-6144 Vol. 2, Part 1A, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1, Main Report (Chapters 1-6).

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Understand the definition of plant operational states for BWRs and PWRs used in the Phase 2 Shutdown SDP templates.

2. Understand the definition of shutdown initiating events for BWRs and PWRs used in the Phase 2 Shutdown SDP templates.

3. Identify dominant contributors of PWR Shutdown Risk based on the Surry Shutdown PRA.

4. Identify dominant contributors of BWR Shutdown Risk based on the Grand Gulf Shutdown PRA.

TASKS:

1. Read the Basis Document for the BWR and PWR SDP shutdown templates to:

   - understand how the BWR and PWR Shutdown SDP templates are constructed.

   - understand key shutdown definitions necessary to use the templates and discuss shutdown risk concepts.

2. Review IMC 609, Appendix G and Attachments 1, 2, and 3 to familiarize yourself with the SDP for shutdown operations.

3. Read the Executive Summary (ONLY) of NUREG/CR-6144 Vol. 2, Part 1A, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1, Main Report (Chapters 1-6). Scan sections S.1, S.2, and S.3. Read Sections S.4, S.5, and S.6 (pages xxxi - xxxvii) in detail to understand the dominant contributors to PWR Shutdown Risk.

4. Read the Executive Summary (only) of NUREG/CR-6143 Vol. 2, Part 1A, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Grand Gulf, Unit 1, Main Report (Sections 1-9). Scan section 1.1 and 1.2. Read Sections 1.3 and 1.4 (pages 1-2 - 1-7) in detail to understand the dominant contributors to BWR Shutdown Risk.

5. Discuss shutdown risk concepts with the PRA Branch/NRR technical expert to gain an appreciation/understanding of shutdown risk and its application the SDP.

6. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-6

SRA Individual Study Activity

TOPIC: (ISA-SRA-7) Emergency Operating Procedure Guidance

PURPOSE: It is paramount that SRAs understand the dominant accident sequences for a given initiating event. To fully understand the accident sequence, SRAs must understand the expected operator response(s) to an accident. That expected response is contained within the licensee's Emergency Operating Procedure network. Understanding the expected response will be used by an SRA when providing guidance to inspectors for inspection planning, when evaluating SDP Phase 2 notebook results from inspectors and when independently developing or reviewing licensee derived human failure probabilities for a SDP Phase 3 evaluation.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 24 hours

REFERENCES:

1. Current owner's group Technical Basis Document (TBD)
2. Licensee's deviation document from the owner's group Document
3. Licensee's Current EOPs
4. Licensee's current abnormal operating procedures for loss of service water, component cooling water, DC & key AC electrical buses
5. Licensee specific SDP Phase 2 risk -informed inspection notebook

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Identify the general plant and operator response to a Loss of Offsite Power.
2. Identify the general plant and operator response to a Loss of Reactor Coolant.
3. Identify the general plant and operator response to a Steam Generator Tube Rupture (PWR).

4. Identify the general plant and operator response to a total Loss Secondary Side Heat Removal (PWR).

5. Identify the general plant and operator response to a Loss of Service Water.

6. Identify the general plant and operator response to a Loss of Component Cooling Water.

7. Identify the general plant and operator response to a loss of DC power.

8. Identify the general plant and operator response to a loss of a Emergency Diesel powered bus.

9. Understand what operator actions (inside and outside the control room) are necessary to accomplish the below listed tasks and what indications would be used to determine the need to perform the actions for each of the following:

   - High Pressure Recirculation
   - Low Pressure Recirculation
   - Depressurizing the Reactor Coolant System given a failure of High Pressure Injection systems
   - Feed & Bleed Cooling (PWR)
   - Placing the Station Blackout Electrical Power Source (if any) into service
   - Refilling the Condensate Storage Tank
   - Refilling the Refueling Water Storage Tank (PWR)
   - Restoring Reactor Coolant Pump Seal Cooling (PWR)
   - Providing alternate cooling to High Head Cooling Water Pumps
   - Resetting a turbine driven pump that has tripped on overspeed

TASKS:

1. Select a particular plant

2. Review the applicable Owner's Group Guideline (TBD) for the particular accident sequence of interest.

3. Review the licensee's deviation document for that section of the TBD.

4. Review the licensee's EOPs and AOPs for the applicable accident sequence.

5. Compare the licensee's assessment of operator actions to those in the risk-informed inspection notebook noting any significant differences in human error probabilities.

6. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-7

SRA Individual Study Activity

TOPIC: (ISA-SRA-8) Management Directive 8.3, "NRC Incident Investigation Program"

PURPOSE: This activity will familiarize you with the NRC's process for responding to significant operational events involving reactor and materials facilities. This process is designed to ensure that significant operational events are investigated in a timely, objective, systematic, and technically sound manner; that the factual information pertaining to each event is documented; and that the causes of each event are determined. The NRC's response to these events varies according to the significance of the event. Consequently, the risk insights provided by the SRA are integral to determining the appropriate level of event response, if any.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. Management Directive 8.3, "NRC Incident Investigation Program"
2. Inspection Procedure 71153, "Event Follow-up"
3. Inspection Procedure 93800, "Augmented Inspection Team"
4. Inspection Procedure 93812, "Special Inspections"
5. NUREG-1303, "Incident Investigation Manual"
6. NRR Office Instruction LIC-405, " Risk-Informed Event Response"

NOTE: This activity must be completed before beginning the OJT on MD 8.3 Requirements.

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Locate the current guidance on the NRC's Incident Investigation Program.

2. Describe what constitutes a significant operational event.

3. Discuss the deterministic criteria that significant operational events are evaluated against.

4. Discuss the risk metrics used in the evaluation of significant operational events, including significant unplanned degraded conditions.

5. Discuss how plant configuration is accounted for during the evaluation of significant operational events, including significant unplanned degraded conditions.

6. Describe the levels of investigatory response and discuss the circumstances under which each is appropriate.

TASKS:

1. Review the references and develop a sufficient understanding of the Incident Investigation Process to fulfill the evaluation criteria.

2. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-8

SRA Individual Study Activity

TOPIC: (ISA-SRA-9) Understanding the Development of Accident Sequence Precursor (ASP) Results

PURPOSE: Understanding and explaining the differences in risk assessments of the same event by different programs is one of the challenges you will face as an SRA. This activity will introduce you to the ASP program, one of the primary risk evaluation programs in the NRC.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 8 hours

REFERENCES:

1. Accident Sequence Precursor Program Description, dated 6/12/2003. (Note -To be made available on the APOB website, not currently accessible)

2. ASP analysis for an event of interest.

3. Response to SRM - M020319, dated 4/1/2002, Briefing on Office of Nuclear Regulatory Research Programs, Performance, and Plans. (ML022050474)

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Describe the purpose of the ASP program and explain how it differs from the SDP.

2. Describe the content and format of an ASP report.

3. State the primary differences between ASP and SDP.

TASKS:

1. Review reference one above and compare the ASP process to the SDP process.

2. Select an appropriate ASP report and perform the review process described in reference one. The student should be familiar with all of the sections of the ASP report.

3. Meet with analysts in the Operating Experience and Analysis Branch/RES to discuss the ASP program. Focus the discussion on how ASP analyses are performed and their purpose.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-9

SRA Individual Study Activity

TOPIC: (ISA-SRA-10) The Role of the SRA in the NOED Process

PURPOSE: This activity will introduce you to the role of the SRA in the NOED process. Integral to the NOED is a requirement for the licensee to provide at least a qualitative risk assessment that demonstrates that the NOED does not involve any net increase in radiological risk.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. NRC Inspection Manual, Part 9900: Technical Guidance, Operations - Notices of Enforcement Discretion
2. Regulatory Information Summary 2005-01, "Changes to Notice of Enforcement Discretion (NOED) Process and Staff Guidance"
3. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-informed Decisions on Plant-Specific Changes to the Licensing Basis"
4. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications"
5. Regulatory Guide 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants"
6. NUMARC 93-01, Revision 2, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"
7. Memorandum to Hubert Berkow, dated 7/18/2005, "Independent Assessment of Brunswick NOED 05-2-001 (ML051800286).

NOTE: You must complete this activity before beginning the OJT on NOEDs.

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Be familiar with the content and format of an NOED, especially in the area of the risk assessment required from the licensee to support the NOED request.

2. Understand the basis of “no net increase” in radiological risk and the methodologies a licensee may use for a qualitative or quantitative assessment.

3. Understand why there is no adequate basis for licensees who claim that the “scram risk CCDP” is a surrogate for transition and shutdown risk.

4. Understand how a SPAR model can be used to determine the risk involved with the extended TS LCO time requested in the NOED.

5. Understand the importance of compensatory actions used by the licensee during the extended TS LCO time period.

6. Be able to explain how a PRA model should be adjusted to account for NOED request and use of the appropriate risk measure (e.g., ICCDP vs. ICCDF and ICLERP vs. ICLERF).

TASKS:

1. Review a recent NOED that was granted. The student should pay particular attention to the following areas:

   - the licensee’s qualitative or quantitative risk assessment
   - compensatory actions taken by the licensee during the extended TS LCO duration
   - extent of condition and potential common cause failures
   - any external weather factors that may have impacted the NOED duration

2. Review a SPAR model condition assessment for the extended TS LCO duration requested in the NOED and compare those results to the risk assessment used by the licensee.

3. Review the seven (7) specific risk related items identified in Part 9900 that should be addressed by the licensee in the NOED request.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

5. Review the memorandum to Hubert Berkow, dated 7/18/2005, "Independent Assessment of Brunswick NOED 05-2-001 (ML051800286). Discuss the findings with a qualified SRA.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-10

SRA Individual Study Activity

TOPIC: (ISA-SRA-11) System Reliability Studies

PURPOSE: This activity will familiarize you with the NRC's analysis of operating experience as documented in the NUREG/CR-5500 series. These studies conducted by INEEL, form the basis for some if the reliability and availability data used in the current SPAR models.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 8 hours

REFERENCES: There have been 11 System Reliability Studies issued so far, as separate volumes to NUREG/CR-5500, covering system data over specific periods of time:

Vol 1 AFW; 1987 - 1995; INEEL/EXT-97-00740
Vol 2 Westinghouse RPS; 1984 - 1995; INEEL/EXT-97-00740
Vol 3 GE RPS; 1984 - 1995
Vol 4 HPCI; 1987 - 1993; INEEL 94/0158
Vol 5 EDG; 1987 -1993; INEEL 95/0035
Vol 6 Isolation Condenser; 1987 - 1993; INEEL 95/0478
Vol 7 RCIC; 1987 - 1993; INEEL 95/0196
Vol 8 HPCS; 1987 - 1993; INEEL 95/00133
Vol 9 HPSI; 1987 - 1997; INEEL 99/00373
Vol 10 CE RPS; 1984 - 1998; INEL/EXT 97-00740
Vol 11 B&W RPS; 1984 -1998; INEL/EXT-97-00740

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Discuss the general format and methods used in the evaluations.

2. Recognize the limitations of the data.

TASKS:

1. Locate the listed references and select one for detailed review.

2. Review the definitions in the Terminology section. Pay attention to fails to run (FTR), fails to start (FTS), maintenance out of service(MOOS), p-value, and reliability.

3. Develop an understanding of the general format and information presented, paying attention to: Section 2 - Scope

of Study; Section 3 - The Risk Based Analysis of the Plant Operating Data; and Section 4 - Engineering Analysis of Operating Data.

4. Select a plant SPAR model notebook and review the basic event data; selected two or three basis events that reference system reliability studies as their basis. Review the referenced studies to see how the specific data was developed. NOTE: Some SPAR model notebooks only reference the INEEL/INEL report number not the NUREG/CR 5500 volume number.

5. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-11

SRA Individual Study Activity

TOPIC: (ISA-SRA-12) Conducting an SDP Phase 3 Analysis

PURPOSE: SRAs are the regional focal point for inspection findings that need further review beyond the SDP Phase 1 and 2 processes. As such, it is essential that SRAs effectively evaluate inspection findings using the best available to determine the NRC's appropriate response.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 40 Hours

REFERENCES:

1. IMC 609, Attachment 1, Significance and Enforcement Review Process
2. IMC 609, Appendix A, Significance Determination of Reactor Inspection Findings for At-Power Situations

EVALUATION CRITERIA: At the completion of this activity, you should be able to:

1. Understand when a Phase 3 analysis is needed to refine an SDP Phase 2 result.
2. Be able to explain the importance of using the best available information when conducting a Phase 3 analysis and how that relates to the SDP timeliness goals.
3. Describe the essential attributes of a Phase 3 analysis. In particular, the importance of the influential assumptions used for the safety significance of the inspection finding.
4. Describe the need for effective verbal and written communication skills (for the SERP Process) as they relate to helping non-risk analyst understand the significance of the finding.
5. Describe the importance of interacting with other SRAs and risk analysts, as needed, to ensure a proper peer check of the results has been achieved.

TASKS:

1. Review at least two completed SERP packages for technical content and format. In particular, assess the understandability of the information presented.

2. Observe at least two presentations of greater than Green reactor safety inspection findings to the SERP panel.

3. Observe at least one regulatory conference.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item ISA-SRA-12

SRA Individual Study Activity

TOPIC: (ISA-SRA-13) The Role of the SRA in Inspection Planning

Under development

SRA Individual Study Activity

TOPIC: (ISA-SRA-14) Large Early Release Frequency (LERF)

Under development

Senior Reactor Analyst Rotational Assignments

Senior Reactor Analyst On-the-Job Activity

TOPIC: (ROT-SRA-1) Rotational Assignment to APOB/NRR

PURPOSE: The purpose of this assignment is to help the SRA to become thoroughly familiar with the operation and risk analysis tools and techniques used by the PRA Operational Support and Maintenance Branch (APOB) at NRC Headquarters. Those permanently assigned to APOB are not required to complete this rotation.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE

LEVEL OF EFFORT: Length of rotation is 2 months.

REFERENCES: None

EVALUATION CRITERIA: Upon completion of the tasks, you should be able to:

1. Demonstrate proficiency in using SAPHIRE/GEM to assess the risk of events and conditions.

2. Be able to identify lead technical experts in NRR and Research, who can provide information on structure, system and component performance to be used in risk assessments.

3. Demonstrate an understanding of risk application to licensee program change submittals and technical specification amendments.

TASKS:

1. Run ASP/SPAR model analyses using SAPHIRE/GEM and/or interpret existing PRA results for event/condition evaluation or for inspection planning/focus.

2. Assist with resolution of Maintenance Rule PRA issues or discuss how risk insights are used in the maintenance rule with lead technical experts in APOB/NRR.

3. Discuss current risk issues with insights and applications with lead technical experts in APOB/NRR in the following areas:
   a. Containment Performance
   b. Event Analysis and Response
   c. SDP phase 2 worksheet development
   d. External Event Analysis (includes fire risk and shutdown risk)

4. Discuss the use of risk insights for event/condition response using MD 8.3 with IRO, NRR event assessment, and APOB personnel.

5. Understand computer-based simplified PRA (SPAR) models:
   a. Perform sensitivity studies and generate and interpret various importance measures
   b. Identify and understand modeling and data limitations
   c. Perform analysis of at least 3 selected events from NUREG/CR-4674 (Precursors to Potential Severe Core Damage Accidents) using the appropriate model and compare your results with ASP results. Discuss any differences with an SRA or HQ risk analyst.

6. Discuss risk application with SRA or HQ risk analyst regarding:
   a. Decision criteria for PRA use (e.g. risk-informed licensee amendments)
   b. ISI/IST Graded QA
   c. Technical Specifications
   d. Use in SDP phase 1 and phase 2 Worksheets
   e. Limitations of on-line risk monitoring software (e.g. re-qualification vs. re-solving)

7. Make an oral presentation to an audience, including risk analysts, on a risk subject of interest chosen by the SRA trainee or on an analysis/event assessment performed during the rotation.

8. Meet with a qualified SRA or risk analyst to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: SRA Proficiency Level Qualification Signature Card Item ROT-SRA-1

Senior Reactor Analyst On-the-Job Activity

TOPIC: (ROT-SRA-2) Rotational Assignment to Regional Office

PURPOSE: The purpose of this assignment is to help the SRA to become thoroughly familiar with the application of operation and risk analysis tools and techniques to emerging plant events and inspection findings.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE

LEVEL OF EFFORT: Length of rotation is 2 months.

> **Note**: Rotation may not be to your home region. For headquarters personnel, the selection of the region at which you will do your rotation must be agreed upon by

> **Note**: Equivalency justification for this rotational assignment is not permitted.

REFERENCES: None

EVALUATION CRITERIA: Upon completion of the tasks, you should be able to:

1. Understand the SRA role in evaluating the risk associated with inspection findings.
2. Understand the SRA role in evaluating the significance of operational events.
3. Understand the SRA role in inspection planning.
4. Understand the SRA role in evaluating licensee NOED requests.
5. Understand the SRA role as a regional lead for effective internal and external risk communications.

TASKS:

1. Evaluate the potential risk significance of plant events and inspection findings using known risk insights, the SDP, and quantitative assessment techniques. Integrate these risk insights with other regulatory insights, and develop

recommendations to NRC management for appropriate regulatory responses (including enforcement) based on these insights

2. Evaluate licensee PRA practices and specific analyses for adequacy (e.g. Maintenance Rule)

3. Discuss awareness of the risk assessment capabilities, limitations of licensee-generated risk insights, and NRC-generated risk insights for those licensees specifically assigned. Integrate these risk insights with other regulatory insights (e.g. defense-in-depth, licensing basis, performance history). Based on the above, develop risk-informed insights for use in inspection planning.

4. Participate with other NRC offices (e.g. RES, NRR) performing PRA or SDP related functions.

5. Brief/advise regional management on significant PRA or SDP issues and changes.

6. Provide an oral presentation on important risk insights to inspectors and other staff. Provide specific SDP and other risk assessment assistance to inspectors.

7. Participate in the inspection planning phase by reviewing plant PRA information and providing risk insights to the inspectors.

8. Attend regulatory or enforcement panel briefing and participate in the evaluation of inspection findings.

NOTE: If the assignments can not be completed while on rotational assignment to headquarters or assigned regional office, they may be completed in the candidate's home office/region under the supervision of a qualified SRA. The qualified SRA is required to sign the qualification card for the completed assignments.

9. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: SRA Proficiency Level Qualification Signature Card Item ROT-SRA-2.

Senior Reactor Analyst On-the-Job Activities

SRA On-the-Job Activity

NOTE: You should complete this activity during the Rotational Assignment to the Regional Office or NRR/APOB.

TOPIC: (OJT-SRA-1) Performing an Independent Review of a Significance Determination Process and Enforcement Review Panel (SERP) Package

PURPOSE: An SRA must be able to communicate risk insights and information to senior management in a manner that it can be understood and used to make regulatory decisions. The SERP package is one of the major products prepared for this purpose. Additionally, the SRA will be asked to peer review the packages prepared by their counterparts.

COMPETENCY AREAS:
TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 8 hours

REFERENCES:

1. Inspection Manual Chapter 0609, Attachment 1, "Significance and Enforcement Review Process"
2. Inspection Manual Chapter 0612, "Power Reactor Inspection Reports," Appendices B and E
3. Inspection Manual Chapter 0609, Appendix A, "Significance Determination Process of Reactor Inspection Findings for At-Power Situations"

EVALUATION CRITERIA:

1. Evaluate selected SERP package to determine that key considerations and components have been incorporated.
2. Ensure that the finding is well documented and meets program requirements.
3. Assess the quality and completeness of the risk evaluation.

TASKS:

1. Read the following sections of Attachment 0609.01:
   - 1. Scope
   - 2.a. Preparation for the SERP
   - Exhibit 1, "SERP Worksheet for SDP-Related Findings"

2. Select a completed risk-informed SERP package for review. Read through the package to determine that the criteria in Exhibit 4 are documented.

3. Determine that the performance deficiency is concise and was within the ability of the licensee to control.

4. Independently make the minor finding determination using Manual Chapter 0612 and compare your results with the determination made by the inspectors.

5. Independently conduct a Phase 1 screening and compare the result with the screening documented in the SERP package.

6. Review the Phase 3 assessment. Ensure that assumptions are precise and defensible. Verify that the analysis is only evaluating the performance deficiency and not collateral issues.

7. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item OJT-SRA-1

SRA On-the-Job Activity

TOPIC: (OJT-SRA-2) Perform a Phase 3 Significance Determination Process Evaluation

NOTE: You should complete this activity during the rotational assignment to the Regional Office or NRR/APOB.

PURPOSE: An SRA must be able to evaluate inspection findings and communicate risk insights and information to senior management in a manner that it can be understood and used to make regulatory decisions. The Phase 3 package is one of the major products prepared for this purpose.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 40 hours

REFERENCES:

1. Inspection Manual Chapter 0609, Attachment 1, "Significance and Enforcement Review Process"
2. Inspection Manual Chapter 0612, Appendices B and E
3. Inspection Manual Chapter 0609, Appendix A, "Significance Determination Process of Reactor Inspection Findings for At-Power Situations"
4. Other Inspection Manual Chapter 0609 Appendices as applicable.

EVALUATION CRITERIA:

1. Perform a Phase 3 SDP evaluation. This evaluation is intended to be a significant effort and should involve the use of multiple risk assessment tools. The evaluation must include an evaluation of external events and LERF.
2. Ensure that the evaluation is well documented and meets program requirements.

TASKS:

1. Work with the regional SRA to identify a suitable performance deficiency for this task. The issue should be significant enough to demonstrate the ability to perform complex evaluations.

2. Determine that the performance deficiency is concise and was within the ability of the licensee to control.

3. Independently make the minor finding determination using IMC 0612 and compare your results with the determination made by the inspectors.

4. Independently conduct a Phase 1 screening and compare the result with the screening documented by the inspectors.

5. Independently conduct a Phase 2 evaluation and compare the result with the evaluation documented by the inspectors.

6. Perform the Phase 3 assessment. Ensure that assumptions are precise and defensible. Verify that the analysis is only evaluating the performance deficiency and not collateral issues.

7. Present the finding to the SERP for their review. Participate, as needed, in any followup discussions at the regulatory conference and caucus. Provide documentation for the analysis section of the inspection report or letter to the licensee describing the inspection finding.

8. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item OJT-SRA-2

SRA On-the-Job Activity

NOTE: You should complete this activity during the rotational assignment to Regional Office or NRR/APOB.

TOPIC: (OJT-SRA-3) Management Directive 8.3, "NRC Incident Investigation Program"

PURPOSE: The purpose of this activity is to familiarize you with the conduct of risk assessments of reactor events and significant unplanned degraded conditions in support of the NRC's Incident Investigation Program.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. Management Directive 8.3, "NRC Incident Investigation Program"
2. Inspection Procedure 71153, "Event Follow-up"
3. NRR Office Instruction 405, "Risk-Informed Event Response"

NOTE: You must complete the Individual Study Activity on MD 8.3 before beginning this OJT Activity.

EVALUATION CRITERIA: Complete the tasks assigned in this OJT guide and meet with a qualified Senior Reactor Analyst to discuss any questions that you may have as a result of this activity. Upon completion of the tasks, you should be able to:

1. Discuss what information is needed to conduct risk assessments of significant operational reactor events and significant unplanned degraded conditions.
2. Discuss how to conduct a risk assessment of a significant operational reactor event using the NRC's SPAR models.

3. Discuss how to conduct a risk assessment of a significant unplanned degraded condition using the NRC's SPAR models.

4. Discuss how to modify an SPAR model to account for the plant configuration at the time of the event or condition.

TASKS:

1. Review at least one completed risk assessment for both a significant operational reactor event and a significant unplanned degraded condition.

2. Perform a risk assessment of a significant operational reactor event using the appropriate NRC SPAR model and document the results.

3. Perform a risk assessment of a significant unplanned degraded condition using the appropriate NRC SPAR model and document the results.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item OJT-SRA-3

SRA On-the-Job Activity

NOTE: You should complete this activity during the rotational assignment to the Regional Office.

TOPIC: (OJT-SRA-4) Performing an NOED Risk Review

PURPOSE: This activity will introduce you to the SRA's responsibility in reviewing the licensee's risk assessment for an NOED request. Integral to the NOED is a requirement for the licensee to provide at least a qualitative risk assessment that demonstrates that the NOED does not involve any net increase in radiological risk.

COMPETENCY AREAS: TECHNICAL AREA EXPERTISE
INSPECTION

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. NRC Inspection Manual, Part 9900: Technical Guidance, Operations - Notices of Enforcement Discretion

2. Regulatory Issue Summary 2005-01, "Changes to Notice of Enforcement Discretion (NOED) Process and Staff Guidance"

3. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-informed Decisions on Plant-Specific Changes to the Licensing Basis"

4. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk -Informed Decision Making: Technical Specifications"

2. Regulatory Guide 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants"

3. NUMARC 93-01, Revision 2, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

NOTE: You must complete the Individual Study Activity on NOEDs before beginning this OJT.

EVALUATION

CRITERIA: At the completion of this activity, you should be able to:

1. Understand the risk assessment methodologies used by licensees to meet the requirement that a risk assessment supporting an NOED request must address the risk of shutting down versus the risk of continued operation with the degraded equipment.

2. Understand the basis of "no net increase" in radiological risk and the methodologies a licensee may utilize to qualitatively or qualitatively demonstrate this.

3. Understand how SPAR can be used to determine the risk involved with the extended TS LCO time requested in the NOED.

4. Understand the importance of compensatory measures used by the licensee during the extended TS LCO time period.

5. Be able to explain how a PRA model should be adjusted to account for NOED request and use of the appropriate risk measure (e.g., ICCDP, vs. ICCDF and ICLERP vs. ICLERF).

TASKS:

1. Review at least three NOEDs that were granted (preferably from different regions). When reviewing the NOEDs, look for the following areas:

   - the licensee's qualitative or qualitative risk assessment addressing the risk of shutting down versus the risk of remaining at power with the degraded equipment
   - compensatory measures taken by the licensee during the extended TS LCO duration such as: a hold on any maintenance and testing of other risk significant equipment, protection of opposite train equipment, or the prohibition of switchyard work
   - any external weather factors that may impact the NOED duration
   - operator action credited

2. Run a SPAR model condition assessment for the extended TS LCO duration for the degraded equipment as requested in the NOED. Compare those results to the risk assessment results reported by the licensee.

3. If possible, perform the review of an actual NOED request with the supervision of a qualified SRA. Interact with the licensee on the NOED call and present the results of the review to the appropriate regional manager.

4. Meet with a qualified SRA to discuss any questions that you have as a result of this activity and demonstrate that you can meet the evaluation criteria listed above.

DOCUMENTATION: Senior Reactor Analyst Qualification Signature Card, Item OJT-SRA-4

Senior Reactor Analyst
Signature Card and Certification

Name: _____	*Employee Initials/Date*	*Evaluator/Supervisor Signature/Date*
A. Training Courses		
BWR technology full series		
PWR technology full series		
Probability and Statistics for PRA Course (P-102)		
System Modeling Techniques Course for PRA (P-200)		
Human Reliability Assessment Course (P-203)		
Risk Assessment in Event Evaluation Course (P-302)		
PRA Technology and Regulatory Perspective (P-111)		
SAPHIRE Course (P-201)		
Advanced SAPHIRE Course (P-202)		
External Events (P-204)		
Accident Progression Analysis (P-300) or Reactor Safety (R-800)		
B. Individual Study Activities		
ISA-SRA-A Building your SRA Reference Library (proposed)		
ISA-SRA-B PRA Principles and Regulatory Guidance for SRAs		
ISA-SRA-C Understanding How Full Scope PRA Models were Developed		
ISA-SRA-D Understanding How Full Scope PRA Models Were Developed		
ISA-SRA-1 Significance Determination Process and Its Basis		
ISA-SRA-2 Limitations of Licensee PRAs		
ISA-SRA-3 PRA Quality Initiative		
ISA-SRA-4 IPEEE Lessons Learned		
ISA-SRA-5 Understanding How EPRI Documents are Used by Licensees		
ISA-SRA-6 Overview of Shutdown Risk		
ISA-SRA-7 Emergency Operating Procedure Guidance		
ISA-SRA-8 Management Directive 8.3, “NRC Incident Investigation Program”		

ISA-SRA-9 Understanding the Development of Accident Sequence Precursor (ASP) Results		
ISA-SRA-10 The Role of the SRA in the NOED Process		
ISA-SRA-11 System Reliability Studies		
ISA-SRA-12 Conducting a SDP Phase 3 Analysis		
ISA-SRA-13 The Role of the SRA in Inspection Planning (proposed)		
ISA-SRA-15 LERF (proposed)		
C. Rotational Assignments		
ROT-SRA-1 Rotation to APOB		
ROT-SRA-2 Rotation to Regional Office		
D. On-the-Job Training Activities		
OJT-SRA-1 Performing an independent Review of a Significance Determination Process/Enforcement Review Panel (SERP) Package		
OJT-SRA-2 Perform a Phase 3 Significance Determination Process Evaluation		
OJT-SRA-3 Management Directive 8.3, "NRC Incident Investigation Program"		
OJT-SRA-4 Performing a NOED Risk Review		

The individual's supervisor signature below indicates successful completion of all required courses and activities listed in this Appendix and readiness to appear before the Qualification Board.

Supervisor's Signature: _____ Date:_____

The Qualification Board Chairman's signature below indicates that the individual has successfully passed the qualification board and is a fully certified SRA. The board chairman must send a memorandum to the individual's management and to the applicable Office of Human Resources indicating successful completion of the SRA Certification Program. This completed signature and certification form should be attached to the memorandum.

Qualification Board Chairman:_____ Date:_____

Senior Reactor Analyst ***Equivalency Justification***	
*Name:*_____	*Identify equivalent training and experience for which the individual is to be given credit. Attach additional sheets as necessary*
A. Training Courses	
BWR technology full series	
PWR technology full series	
Probability and Statistics for PRA Course (P-102)	
System Modeling Techniques Course for PRA (P-200)	
Human Reliability Assessment Course (P-203)	
Risk Assessment in Event Evaluation Course (P-302)	
PRA Technology and Regulatory Perspective (P-111)	
SAPHIRE Course (P-201)	
Advanced SAPHIRE Course (P-202)	
External Events (P-204)	
Accident Progression Analysis (P-300) or Reactor Safety (R-800)	
B. Individual Study Activities	
ISA-SRA-A Building your SRA Reference Library (proposed)	
ISA-SRA-B Review of NRC Approach to Risk-Informed and Performance-Based Regulation	

ISA-SRA-C Review of Historical NRC Severe Accident Risk Evaluations and the Methodologies Used in the Analyses	
ISA-SRA-D Understanding How Full Scope PRA Models Were Developed	
ISA-SRA-1 Significance Determination Process and Its Basis	
ISA-SRA-2 Limitations of Licensee PRAs	
ISA-SRA-3 PRA Quality Initiative	
ISA-SRA-4 IPEEE Lessons Learned	
ISA-SRA-5 Understanding How EPRI Documents are Used by Licensees	
ISA-SRA-6 Overview of Shutdown Risk	
ISA-SRA-7 Emergency Operating Procedure Guidance	
ISA-SRA-8 Management Directive 8.3, “NRC Incident Investigation Program”	
ISA-SRA-9 Understanding the Development of Accident Sequence Precursor (ASP) Results	
ISA-SRA-10 The Role of the SRA in the NOED Process	
ISA-SRA-11 System Reliability Studies	
ISA-SRA-12 Conducting an SDP Phase 3 Analysis	
ISA-SRA-13 The Role of the SRA in Inspection Planning (proposed)	
ISA-SRA-14 Large Early Release Frequency (LERF) (proposed)	
C. Rotational Assignment	

ROT-SRA-1 Rotation to APOB (Concurrence by APOB management required)	
C. On-the-Job Training Activities	
OJT-SRA-1 Performing an Independent Review of a Significance Determination Process/Enforcement Review Panel (SERP) Package	
OJT-SRA-2 Perform a Phase 3 Significance Determination Process Evaluation	
OJT-SRA-3 Management Directive 8.3, "NRC Incident Investigation Program"	
OJT-SRA-4 Performing a NOED Risk Review	

Supervisor's Recommendation: Signature / Date_____

Division Director's Approval: Signature / Date:_____

Copies to: Candidate and official training file

Revision History Sheet

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	10/31/06 CN 06-032	To add the Advanced Risk Assessment Topics course as refresher training, update organizational titles, updated reference lists, and incorporate minor editorial changes. Completed 4 year historical CN search	None	N/A	N/A