



# U.S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation

## ***NRR OFFICE INSTRUCTION***

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### **Change Notice**

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**Office Instruction No.:** ADM-507

**Office Instruction Title:** "Grow Your Own" PRA Analyst Training Qualification Program

**Effective Date:** November 5, 2012

**Approved By:** Christopher M. Regan

**Date Approved:** November 1, 2012

**Primary Contact:** Jeff A. Circle  
301-415-1152  
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**Responsible Organization:** NRR/DRA

**Summary of Changes:** This is the initial issuance of ADM-507. The purpose of this OI is to prepare a comprehensive hands-on training qualification program for newly selected personnel to the "Grow Your Own" (GYO) Probabilistic Risk Assessment (PRA) analyst training qualification program.

**Training:** None

**ADAMS Accession No.:** ML12229A266



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**Training:** None

**ADAMS Accession No.:** ML12229A266

Obtain concurrences as necessary.

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NRR OFFICE INSTRUCTION  
ADM-507  
“Grow Your Own” PRA Analyst Training Qualification Program

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**1. POLICY**

It is the policy of the Office of Nuclear Reactor Regulation (NRR) that all employees have a training plan which facilitates gaining the knowledge and skills necessary to perform effectively in their jobs. This Office Instruction (OI) provides guidance for the creation of training plans for PRA analysts who join NRR under the “Grow Your Own PRA Analysts” program.

**2. OBJECTIVES**

The objective of the Office Instruction (OI) is to prepare a comprehensive hands-on training qualification program for newly selected personnel to the “Grow Your Own” (GYO) Probabilistic Risk Assessment (PRA) analyst training qualification program. Since candidates selected to the GYO PRA Analyst training qualification program are not required to have extensive PRA analyses experience, this program will require additional training beyond the existing Appendix M of ADM 504, “Qualification for Reliability and Risk Analysts”. This OI both defines knowledge standards to facilitate a trainee’s understanding of expectations to perform his or her job and outlines a comprehensive training program enabling that individual to meet those standards. Utilization of this OI provides guidance for an individual to obtain and transfer knowledge necessary to perform the technical duties assigned to a Reliability and Risk Analyst within NRR. This OI promotes consistency in the qualification process for staff members pursuing the analyst position. Successful completion of the training program results in issuance of analyst certification and, for grade level GG-13 candidates, a promotion to grade level GG-14 with the title of Reliability and Risk Analyst.

**3. BACKGROUND**

NRR values the contribution which all of its staff makes to support the NRC mission to protect public health, safety, and the environment. As an expression of that value, NRR emphasizes training for employees to foster their ability to execute this mission. Recruitment, development, and retention of Reliability and Risk Analyst staff has long been a challenge at NRC due to the limited national pool of expertise, lengthy training periods to develop staff, and extensive competition, both within and outside the NRC, for experienced analysts. To address this challenge, a multi office recruitment and training effort, with NRO, RES, and NMSS, has been started with NRR taking the lead in its pilot implementation. The goal is to “Grow Your Own” PRA analysts by providing candidates to the program with the necessary basic training and experience to become, after satisfactory completion of the required training, reliability and risk analysts.

#### 4. **BASIC REQUIREMENTS**

##### 4.1 Introduction:

The GYO PRA analyst training and qualification program is an advanced study leading to certification as a grade level GG-14 Reliability and Risk Analyst. This is a competitive program for selected candidates to be transferred and assigned to positions in a PRA technical branch (home branch). In addition to work assignments, individuals selected into this program must successfully complete the formal classroom training courses, learning projects, the individual study activities (ISAs), the on-the-job training activities (OJTs), and the required rotations prior to certification. Some of these activities can be exempted by the home branch chief based on the applicant's prior experience or training. Documentation of such exemptions must be provided by the home branch chief in writing, and should be maintained in the individual's personnel folder.

This training program consists of two components, a core program and an Office specific program. The core training program is described in Enclosure 2 and is supplemented by the office-specific training in Appendix A of this Office Instruction for candidates working in NRR. In addition to periodic evaluation of completed training activities, the candidate must pass a PRA analyst qualification board upon satisfactory completion of all the required program elements. The purpose of the board is to verify that the qualifying individual has gained an acceptable level of knowledge and experience to be certified as a grade level GG-14 Reliability & Risk Analyst.

It is desirable, but not mandatory, for individuals entering the program at grade level GG-13 (Series 0801, 0840, or 1301) to have commercial nuclear power plant system, inspection, or operation experience. Being selected to participate in the PRA analyst training and qualification program involves a requirement to complete the program and be qualified in approximately three years. During this period, the candidate will complete a combination of formal training and learning projects with specific on-the-job training (OJT) in development and application of various areas involving PRA techniques within the NRC. Some of these activities could include possible assignment of work on a full scope level three PRA or other areas of PRA specialty. The period of three years was selected to mature the candidate into a Reliability and Risk Analyst functioning at the GG-14 grade level. The position description of the candidates explicitly identifies the requirement of the candidates to complete PRA training. During the training period, achievements in the area acquiring PRA training skills will be a key component of the candidate's performance rating. To that extent, the home branch chief will use feedback provided by the candidate's technical mentor and/or the rotational branch chief during periodic evaluations. For GG-13 candidates who enter the program, failure to meet a Fully Successful (FS) rating in performance standards may result in removal from the program. Consequently, such candidates will not be promoted to GG-14 positions. After satisfactorily completing the training program by meeting all the requirements,

and with PRA analyst qualification board approval, the candidate will be promoted to grade level GG-14 in the candidate's home branch.

During the period of training the candidate will not be granted rotational assignments or lateral assignments outside of the qualification program without approval of division management (see Equivalency below).

#### 4.2 Prerequisites:

- 1) It is desired but not mandatory that candidates have sufficient experience and training to ensure success in the qualification program. Having this experience will not burden the candidate with additional training outside the program and will allow successful and timely completion of PRA training. The individual should possess experience in one of the following example areas, or their equivalent:
  - Qualification as a basic reactor inspector and work as a site resident inspector.
  - Completion of either PWR or BWR technology full series or equivalent and technical experience in a nuclear power technical branch.
  - Significant experience gained by working in a technical systems, design, or operations position at a nuclear utility licensee, vendor, or architectural/engineering firm.
- 2) This program is not a substitute for NRR's Reactor Technical Reviewer program. A candidate must complete the Reactor Technical Reviewer qualification board to be retained in the PRA analyst training and qualification program.

#### 4.3 Rotational Assignments:

During the training qualification period, the candidate may be required to go on rotational assignments in branches outside of the home branch, division, or program office. These rotations will be tailored based on the candidate's home branch areas of interest, and experience. For example, if a candidate enters the program after having significant reactor experience based on their prior employment at a region or a licensee, they will not be required to perform a rotation at a region. It is expected that the home branch chief will develop the rotation schedule with the rotation branch chief, and with appropriate management approval. Unless exempted, the candidate is expected to attend all assigned classroom training, even while on rotation. Also, a different set of goals, expectations and standards will be developed for the candidate while on rotation. It is encouraged but not mandatory for the rotational branch chief (or designee) to meet periodically with the home branch chief on candidate progress and on completion of the rotation.

4.4 Exemption and Equivalency Justification:

Program requirements, including the 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 will 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. Equivalencies will be approved and documented by the candidate’s home branch chief and division management.

The GYO PRA analyst program is primarily intended to train approved GG-13 and GG-14 candidates. However, given class size and branch needs, elements of the program may be made available for non-GYO PRA branch staff members to participate in. The extent of participation will be at the discretion of the branch chief and will also rely on available resources. The following table provides an overview for the various types of new staff members and expectations.

<b>Grade Level</b>	<b>Status</b>	<b>GYO Program Requirement</b>	<b>Qualification Board</b>	<b>Promotion Guarantee</b>
GG-13	GYO PRA analyst program candidate	Full completion of the program.	Yes	Guaranteed promotion to GG-14 upon successful completion of program.
GG-13	Non-GYO PRA analyst staff	Need to qualify to ADM-504, Appendix M. Optional participation in the program at the discretion of the branch chief.	No	N/A
GG-14	GYO PRA analyst program candidate	Completion of program with accelerated equivalency justification based on the degree of partial PRA experience.	Yes	N/A
GG-14	Non-GYO PRA analyst staff	Need to qualify to ADM-504, Appendix M. Optional participation in program at the discretion of the branch chief.	No	N/A

4.5 Training Qualification Program Organization:

The basic training program parallels the requirements of the existing training qualification plans developed for Risk and Reliability Analysts as documented in NRR Office Instruction ADM-504, Appendix M, “Reliability and Risk Analyst”. It is expected that candidates in this GYO PRA Analyst program must fulfill all these existing requirements with additional specific rotation activities, a learning project,

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and certain activities borrowed from the Senior Reactor Analyst (SRA) qualification plan of Inspection Manual Chapter IMC-1245, Appendix C9, "Senior Reactor Analyst Training Qualification Program". Details of the training requirements are outlined in Appendix A of Enclosure 3 of this OI.

4.6 Review of Completed Training:

Upon completion of each individual training, study, or rotational assignment, the candidate will meet to discuss the results with the branch chief and associated technical mentor. Approval of each completed training activity will come from the branch chief. If the branch chief decides that the candidate has not satisfactorily completed the specific training activity, a remedial course of action may be developed for the candidate at the discretion of the branch chief. Examples of remedial action can include but, are not limited to, re-assignment of Independent Training Activities, additional classroom training, or additional work assignments.

4.7 Documentation:

Documentation of completed training is recorded on the Activity Sign-off Sheet. Equivalency justification for formal training courses, individual study activities, and on-the-job activities are recorded on the Equivalency Justification Form. Candidates are required 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 is required when the individual is preparing to go before the qualification board. Documentation will be incorporated in iLearn.

4.8 Reliability and Risk Analyst Certificate:

At the successful completion of the candidate's board, the qualification board chairman will submit a memorandum to the Director of the home program office to notify senior management of the candidate's accomplishment. A formal certificate will be prepared for the qualifying Reliability and Risk Analyst to be signed by the Director of the home program office. In addition, the Office of Chief Human Capital Officer (OCHCO) must be notified to make permanent the analyst's promotion to GG-14.

4.9 Grievances:

Grievances in the program will be addressed pursuant to the Collective Bargaining Agreement between the U.S. Nuclear Regulatory Commission and the National Treasury Employees Union.

## 5. **RESPONSIBILITIES AND AUTHORITIES**

During the course of the training qualification program, the candidate will interface regularly with the assigned technical mentors, the branch chiefs of the home and rotational branches, and the home division management.

### The Technical Mentor:

For each training module, a technical mentor, who is a subject matter expert in a particular relevant area (or multiple areas), will be assigned to work with the candidate. Assignment will be made by the branch chief, with approval of associated division management, and may span more than one training module. The responsibilities of the technical mentor are:

- Provide technical guidance to the candidate on completion of the training module.
- Assess progress made by the candidate and report this progress to the associated branch chief.
- Help prepare the candidate for any required qualification boards.

During the course of the program, a candidate may have several technical mentors.

### The Home and Rotation Branch Chief:

The home branch chief is the candidate's hiring branch chief and will serve as the candidate's front-line administrative supervisor during and after the entire training qualification process. In addition to the administrative functions, the home branch chief will oversee the approval of the overall training qualification program for the candidate. When on rotation, the rotation branch chief will serve as a temporary technical supervisor. It is encouraged that rotational and home branch chiefs communicate regularly on the candidate's progress. The branch chief will meet with the candidate upon completion of each training, study, or rotational activity in order to decide on approval of satisfactory completion of that activity. Feedback from the respective technical mentors, training personnel, and/or rotational branch chief will be considered. Upon completion of the program, the analyst will be assigned to the home branch.



The Home Division Management:

The home division management consists of the division director and deputy director(s). The home division management in consultation with the branch chief will organize the qualification boards for candidate, make training determinations on equivalency, address grievances in consultation with OCHCO, and approve certification of the candidate upon satisfactory completion of the program. The division director can delegate these functions separately to the deputy director, or other designee.

PRA Analyst Qualification Board:

The PRA Analyst qualification board will consist of a minimum of three members, two of which will be currently qualified and active Senior Level Advisors, GG-15 senior reliability and risk analysts, branch chiefs with PRA background, or SRAs. The role of the board is to certify that the candidate meets the minimum requirement of a reliability and risk analyst and has satisfied the expectations of this training qualification program. The board chairman will be an SES manager, appointed by the home division director (or designee), who is responsible to select board members. The home branch chief will schedule the board meeting. Whenever practical, the individual's home branch chief is encouraged to observe the board proceedings. Once members have been selected, the candidate shall submit a package to the PRA analyst qualification board for review, consisting of documentation of completed work and approvals made during the training qualification program. The purpose of this review is to inform the board of the extent and depth of the analytical work the candidate has performed and to provide the board with the opportunity to explore the benefits gained from those activities. Upon review of the completed work, the board chairman may provide specific direction to the candidate of any additional actions which may be needed to prepare for the board appearance. This may include successful passing of a written exam. The candidate will meet with the board who will then ask questions on various aspects of the program. Upon completion, the board chairman will initiate a memorandum to the candidate's home division management and HR informing them of the results. In the event a candidate is determined by the board to lack knowledge in a particular area(s), at the board chairman's discretion, a remedial strategy can be used to address the area(s) of concern.

The Candidate:

The candidate is responsible for scheduling, maintaining records, and on-time completion of all training activities. It is the expectation that the candidate will work continually with the technical mentors and branch chiefs to ensure that required training activities are scheduled and satisfactorily completed. It is the responsibility of the candidate to communicate any encountered difficulty with management and to pursue resolution.

**6. PERFORMANCE MEASURES****Expectations and Outcomes:**

The candidate shall complete the training qualification program in no longer than three years. Based on extenuating circumstances or need, the home branch chief will determine if additional time is warranted beyond the three year period for the candidate to be qualified. Upon completion of the program, the minimum goal is for the candidate to have the following basic competencies:

- Model specific detailed plant system behavior and operator actions in response to a series of initiating events based on review of engineering design documentation, drawings, procedures, and calculations.
- Collect, evaluate, and integrate operating data into risk model basic events.
- Perform various statistical methods such as Bayesian analysis, common cause failure, and uncertainty.
- Perform human reliability analysis.
- Perform quantification of detailed models using several techniques and to be able to trace-back contributors to risk.
- Modeling and understanding of the special requirements needed for all operating modes and external events, e.g., shutdown, low power, fire, seismic, flooding, severe weather, and other hazards.
- Demonstrate understanding of severe accident phenomena and radionuclide release as they relate to PRA.
- Demonstrate proficiency in PRA software used by the NRC with understanding of licensee's software and results.
- Evaluate risk-informed applications on how they relate to risk models.
- Demonstrate a working knowledge of the various risk-informed initiatives that have been undertaken at the NRC and in industry.

**7. PRIMARY CONTACT**

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**8. RESPONSIBLE ORGANIZATION**

NRR/DRA

**9. EFFECTIVE DATE**

November 5, 2012

**10. REFERENCES**

None.

Enclosures:

1. Change History
2. Core Qualification Program
3. Specific Qualification Programs and Training Requirements - Descriptions of Specific GYO PRA Analyst Activities
4. Forms
  - A. Activity sign-off sheets
  - B. Equivalency Justification and Exemption

**ENCLOSURE 1**

**Change History**

**NRR Office Instruction ADM-507**

**PRA Practitioner Development Program**

<b>ADM-507 Change History - Page 1 of 1</b>			
<b>Date</b>	<b>Description of Changes</b>	<b>Method Used to Announce &amp; Distribute</b>	<b>Training</b>
11/01/12	This is the initial issuance of ADM-507. The purpose of this OI is to prepare a comprehensive hands-on training qualification program for newly selected personnel to the "Grow Your Own" (GYO) Probabilistic Risk Assessment (PRA) analyst training qualification program.	E-mail to NRR staff	None

**ENCLOSURE 2**

**Core Qualification Program**

## CORE QUALIFICATION PROGRAM

### Program Schedule

It is intended for the candidate to complete all the necessary course work and on-the-job training listed in the Core PRA Fundamentals Training Activities table below before moving on to the office-specific training. The candidate's home branch chief may waive any of these required training based on candidates' education and/or experience. Flexibility will be exercised based on availability of classroom training and rotational assignments. To demonstrate proficiency after completion of each training activity, the candidate shall formally meet with the branch chief and technical mentor. A written or oral exam will be given, at the discretion of the branch chief, to determine if the candidate has successfully completed the training activity in order to progress to the next level.

<b>Core PRA Fundamentals Training Activities</b>		
	<b>Number</b>	<b>Description</b>
<b>Classroom Training</b>	P-101	Risk-Informed Regulation for Technical Staff (8 hrs)
	P-105	PRA Basis for Regulatory Applications (21 hrs)
	P-200	Modeling Techniques (24.5 hrs)
	P-102	Probability and Statistics (36 hrs)
<b>Independent Study Activities Derived From ADM-504, Appendix M<sup>1</sup></b>	ISA-1	Principles and Review of NRC Approaches to Risk-Informed Regulation
	ISA-3	Current Risk-informed Applications
	ISA-15	Operating Experience Databases

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<sup>1</sup> NRR Office Instruction ADM 504, "Qualification Program," contains NRR staff qualification requirements. Appendix M (under development) of this Office Instruction ADM-504 provides qualification requirements for a Reliability and Risk Analyst who already possesses basic PRA skills. The subset of ISAs identified here are of a generic nature so that other offices - RES, NRO, NMSS - may choose to include them in their core requirements.

**ENCLOSURE 3**

**Specific Qualification Programs and Training Requirements  
Descriptions of Specific GYO PRA Analyst Activities**



## Program Schedule

The program schedule for candidates in NRR is grouped according to areas of expertise and level. The candidate is expected to complete the PRA Fundamental Activities below as a prerequisite before continuing with the Modeling Experience Activities and the PRA-in-Regulation Activities. Candidates can complete Modeling Experience and PRA-in-Regulation in parallel. For these two groups, schedule and program flexibility will be exercised based on availability of classroom training and rotational assignments. To demonstrate proficiency after completion of each training activity, regardless of type, a written or oral exam will be given at the discretion of the technical mentor or home branch chief.

The branch chief may waive requirements for any of these training requirements or rotations based on the candidate's education or experience.

<b>PRA Fundamental Activities</b>		
	<b>Number</b>	<b>Description</b>
<b>Classroom Training</b>	R-304(B and P)	Full Series - Both BWR and PWR
<b>Independent Study Activities Derived From ADM- 504, Appendix M</b>	ISA-5	IPE /IPEEE study of submittals and of lessons learned
	ISA-6	Overview of shutdown risk
	ISA-7	Large Early Release Frequency (LERF)
	ISA-8	Historical NRC Severe Accident Risk Evaluations
	ISA-19	Climatology
	ISA-10	Specialized Risk-informed Decision-Making Process
<b>Independent Study Activities Derived From IMC-1245, Appendix C9<sup>2</sup></b>	ISA-SRA-5	How licensees use EPRI documents

<sup>2</sup> Inspection Manual Chapter IMC-1245, Appendix C9, "Senior Reactor Analyst Training and Qualification Program", contains relevant training activities for the GYO PRA analyst program.

	<b>Modeling Experience Activities</b>	
	<b>Number</b>	<b>Description</b>
<b>GYO Program-specific Learning Project</b>	LP-GYO-1	PRA Model Learning Project
<b>Independent Study Activities Derived From ADM- 504, Appendix M</b>	ISA-2	PRA Quality Initiative
	ISA-9	ASP analysis
<b>Independent Study Activities Derived From IMC-1245, Appendix C9</b>	ISA-SRA-7	EOP procedure guidance
<b>GYO Program-Specific Independent Study Activities</b>	ISA-GYO-5	Regulatory Framework for New Reactor PRA
<b>Classroom Training</b>	P-202	Advanced SAPHIRE
	P-204	External Events
	P-300	Accident Progression Analysis
	P-301	Accident Consequence Analysis
	External - 1	EPRI/RES Fire PRA Training
	External - 2	EPRI/RES Seismic PRA
	R-800	Perspectives on Reactor Safety
	P-501	Advanced risk assessment topics
	P-203	Human Reliability Analysis
<b>GYO Program-Specific Rotation/On-the-job Training</b>	P-201	SAPHIRE
	OJT-GYO-ROT-1	Rotation to RES on Level III analysis
	OJT-GYO-ROT-2	Remote or on-site rotation to INL to assist in SPAR model development.
	OJT-GYO-ROT-3	Rotation to site resident inspector's office to work with licensee staff on PRA model development and use.

	<b>PRA-in-Regulation Activities</b>	
	<b>Number</b>	<b>Description</b>
<b>Independent Study Activities From ADM- 504, Appendix M</b>	ISA-12	NOED technical guidance
	ISA-13	Reactive inspection technical guidance
	ISA-17	Maintenance Rule, 10 CFR 50.65
	ISA-18	Reactor Oversight Process (ROP) and Significance Determination Process (SDP) Basis
<b>GYO Program-Specific Independent Study Activities</b>	ISA-GYO-1	NFPA-805 review
	ISA-GYO-2	MSPI and NEI-99-02
	ISA-GYO-3	SAMGs (RES video material)
	ISA-GYO-4	SAMA
<b>Classroom Training</b>	P-111	PRA Technology and Regulatory Perspective
	P-302	Risk Assessment in Event Evaluation
	Internal	NFPA-805 LAR training
<b>On-the-job Training and Rotations Derived From ADM- 504, Appendix M</b>	OJT-2	Conduct a Phase 3 SDP
	OJT-7	Perform a reactive inspection evaluation
	OJT-3	Perform a NOED risk review
<b>GYO Program-Specific On-the-Job Training and Rotations</b>	OJT-GYO-ROT-4	Regional office rotations to DRP
	OJT-GYO-ROT-5	Rotations to NRR/DRA branches
	OJT-GYO-ROT-6	Rotation to NRR/DIRS for Maintenance Rule and MSPI
	OJT-GYO-1	Conduct a Phase 3 Shutdown Risk Assessment
	OJT-GYO-2	Write a risk-informed SE

**Description of Specific GYO PRA Analyst Activities**

**LP-GYO-1**  
**GYO Program-specific Learning Project Activity 1**

**TOPIC:** PRA MODEL LEARNING PROJECT

**PURPOSE:** To give a group of analyst candidates experience in conducting a full scope level 1 PRA analysis using practical information from licensees.

**COMPETENCY**

**AREA:** MODELING EXPERIENCE

**PREREQUISITE:** Completion of all PRA Core Fundamental and PRA Fundamental activities. Modeling experience activities are a co-requisite.

**LEVEL**

**OF EFFORT:** 6 months

**ACTIVITY:** This is a part-time project for more than one analyst candidate to complete. It is expected for candidates to start on this project after most of the other training requirements and rotations have been satisfactorily completed. A complete detailed description with a separate set of lesson plans and guides will be used for completion of this activity. The candidates are expected to use existing NRC software for models.

**EVALUATION**

**CRITERIA:** At the completion of this activity, the candidates should demonstrate the following areas of competency:

- Applying calculation results to establish system success criteria.
- Development of event trees for a specific plant.
- Develop system fault trees based on licensee design documents and procedures, e.g., electrical schematics, one-line diagrams, flow diagrams, process and instrumentation diagrams, operating

Description of Specific GYO PRA Analyst Activities

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procedures, etc.

- Evaluation of data and performance of Bayesian updates to establish fault tree basic event probabilities.
- Studying licensee training documents to develop human error probabilities.
- Performance of common cause failure analyses.
- Using licensee information to develop recovery analyses.

**TASKS:**

All candidates shall collaborate to prepare a presentation on the various modules of this learning project. Items to include in the presentation are:

- Methods used in the preparation of parts of the analysis.
- The organization of the learning project team.
- Potential obstacles encountered and how they were solved.
- Technical details of how the assignment was carried out.
- Discussion of details of results.
- Insights gained from the results.
- Overall insights of performing the learning project.

This presentation will be attended by various members of the PRA branches and divisions in NRR with initiations to division representation from other program offices.

Description of Specific GYO PRA Analyst Activities

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**OJT-GYO-ROT-1**  
**GYO On-the-Job Rotation Activity 1**

**TOPIC:** ROTATION TO RES IN SUPPORT OF THE LEVEL 3 PRA PROGRAM (OPTIONAL)

**PURPOSE:** To give the analyst candidate experience in modeling elements of a full scope, all-hazards PRA model based on licensee input.

**PREREQUISITE:** Completion of all PRA Core Fundamental and PRA Fundamental activities.

**COMPETENCY**

**AREA:** MODELING EXPERIENCE

**LEVEL**

**OF EFFORT:** 3-6 months

**ACTIVITY:** As directed by the SRM for SECY-11-089, the Office of Nuclear Regulatory Research (RES) is currently performing a full-scope comprehensive site level 3 PRA project. Some of the work involves a combination of directly adapting level 1 licensee models as well as development of new models. The candidate can gain invaluable experience in providing support to RES and their contractors in adaption and development of these models.

The candidate will gain familiarity with detailed event and system fault tree modeling practices and data analyses. The technical experience will directly help gain insights in future work involving the review of SDP submittals made by regional SRAs and various risk-informed licensing initiatives made by licensees. This rotation is optional, subject to availability and scheduling of activities.

Description of Specific GYO PRA Analyst Activities

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**EVALUATION****CRITERIA:**

At the completion of this rotation, the candidate should demonstrate:

- Proficiency in modeling various sequences and system models that were developed as part of the Level 3 PRA program.
- Proficiency in adapting licensee's models and data into the NRC SAPHIRE SPAR format.
- Perform human reliability analysis calculations using SPAR-H, or other methodology that RES has developed for this project.
- Quantify results and discuss the dominant sequences in relation to core damage and large-early release in terms of cut sets with uncertainty.

**TASKS:**

A representative sample related to each of the evaluation criterion above shall be performed under the guidance of the technical mentor and approval of the home Branch Chief.



**OJT-GYO-ROT-2**  
**GYO On-the-Job Rotation Activity 2**

<b>TOPIC:</b>	<b>REMOTE OR ON-SITE ROTATION TO IDAHO NATIONAL LABORATORY (INL) TO ASSIST IN SPAR MODEL DEVELOPMENT</b>
<b>PURPOSE:</b>	To give the analyst candidate an understanding of the concepts of Standardized Plant Analysis Risk (SPAR) model development in order to gain expertise and competency in making changes to existing models.
<b>PREREQUISITE:</b>	Completion of all PRA Core Fundamental and PRA Fundamental activities and P-201, "SAPHIRE" and P-202, "Advanced SAPHIRE" as a co-requisite.
<b>COMPETENCY AREA:</b>	MODELING EXPERIENCE
<b>LEVEL OF EFFORT:</b>	2-3 months
<b>ACTIVITY:</b>	<p>SPAR models are plant- and site-specific independent models developed by INL for use by NRC personnel. The models are developed with some licensee input and are used extensively in SDP, new reactor licensing, and ASP activities.</p> <p>The goal of this rotation is to give the candidate experience on the detailed development of SPAR models. In the course of preparing an SDP analysis on a finding, SRAs often have to make changes to existing models to account for specific performance deficiencies or conditions. The HQ analyst needs to be able to either review these changes or provide technical support to the SRAs on how to make the changes. This rotation will be under the guidance of INL personnel and can be performed partially at NRC HQ or at INL in Idaho Falls, ID.</p>

Description of Specific GYO PRA Analyst Activities

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**EVALUATION****CRITERIA:**

At the completion of this rotational activity, the candidate should demonstrate:

- Proficiency with SAPHIRE software in modifying and manipulating the SPAR model to account for changes made in the system configurations, success criteria, and data.
- Quantify results using SAPHIRE software and discuss the dominant core damage cut sets and trace back contributing sequences.
- Revise human reliability analysis calculations.
- Modify event and fault trees to account for different conditions outside the base case.

**TASKS:**

Representative examples encompassing all of the above evaluation criteria shall be developed by the technical mentor and to be performed by the analyst candidate with approval of the home Branch Chief.

**OJT-GYO-ROT-3**  
**GYO On-the-Job Rotation Activity 3**

- TOPIC:** ROTATION TO SITE RESIDENT INSPECTOR'S OFFICE TO WORK WITH LICENSEE STAFF ON PRA MODEL DEVELOPMENT AND USE.
- PURPOSE:** To give the analyst candidate experience on how licensees use risk models in support of various technical issues such as 10 CFR 50.65 (a)(4) workweek assessments in the Maintenance Rule, inspection support, and SDP performance deficiencies.
- PREREQUISITE:** Completion of all PRA Core Fundamental and PRA Fundamental activities.
- COMPETENCY AREA:** MODELING EXPERIENCE
- LEVEL OF EFFORT:** 1 month
- ACTIVITY:** Analysts are expected to understand and interpret how licensees develop PRA input to various NRC inspection activities as well as models which are used to manage and assess workweek risk. The goal of this rotation is to give the candidate experience on how licensees interface with NRC personnel from the perspective of the site resident inspector. The analyst candidate should participate in at least one inspection prepared with risk insights from the licensee. With senior resident inspector and licensee management approval, the analyst candidate should work with site licensee PRA personnel on modeling details. This activity can be combined with OJT-GYO-ROT-4, "Regional Office Rotations to DRP". The rotation is subject to availability at one site.

Description of Specific GYO PRA Analyst Activities

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**EVALUATION****CRITERIA:**

At the completion of this activity, the candidate should demonstrate:

- Understanding of how licensee models are used and evaluated in making inspection decisions.
- Understanding of how licensees use risk models in developing a workweek schedule as well as maintenance scheduling practices.
- Understanding of how licensees cope with emergent work.
- Ability to adapt these concepts to NRC SPAR models.

**TASKS:**

Representative examples encompassing all of the above evaluation criteria shall be prepared by the technical mentor with approval of the home Branch Chief.

Description of Specific GYO PRA Analyst Activities

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**OJT-GYO-ROT-4**  
**GYO On-the-Job Rotation Activity 4**

<b>TOPIC:</b>	<b>REGIONAL OFFICE ROTATIONS TO DIVISION OF REACTOR PROJECTS (DRP)</b>
<b>PURPOSE:</b>	To give the analyst candidate experience working with regional office Senior Reactor Analysts and inspectors on SDP findings and risk-informed inspection activities.
<b>PREREQUISITE:</b>	Completion of all PRA Core Fundamental and PRA Fundamental activities, and all ISA and classroom training activities from PRA In-Regulation.
<b>COMPETENCY AREA:</b>	PRA IN REGULATION
<b>LEVEL OF EFFORT:</b>	1-2 month
<b>ACTIVITY:</b>	Analysts in the DRA PRA Operational Support branch (APOB) are expected to provide either technical guidance or peer review on Significance and Enforcement Review Panel (SERP) packages prepared by regional SRAs. These packages evaluate the risk impact of performance deficiencies discovered typically on inspection findings. To gain a perspective and understanding of the process leading up to a SDP finding, the analyst candidate shall take a rotational assignment with the Division of Reactor Projects (DRP) at a regional office. This activity can be combined with OJT-GYO-ROT-3, "Rotation to Site Resident Inspector's Office to Work with Licensee Staff on PRA Model Development and Use". It is intended for the analyst candidate to work

Description of Specific GYO PRA Analyst Activities

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with inspectors and the regional SRAs on the disposition of findings that enter the SDP program. For potentially greater-than-green findings, the candidate shall assist the SRA in preparation of a SERP package for HQ and actively participate at the meeting of the panel. The candidate is also required to participate in any Regulatory Conferences which might arise from potentially greater-than-green SDP findings.

**EVALUATION****CRITERIA:**

At the completion of this activity, the candidate should demonstrate:

- Understanding of the inspection process and how all findings are addressed at the regional office by the SRAs.
- Understanding of how SRAs work with inspectors to disposition findings through the SDP.
- Understanding of how SRAs engage the licensee on the modeling of findings through the SDP.
- Understanding of detailed steps used at the regional office on how to prepare for a SERP meeting.
- Understanding of how to conduct a SDP Phase 3 analysis.
- If available, an understanding of how regional office staff work on preparation for a regulatory conference.
- Ability to discuss these details with the perspective of HQ office staff.

**TASKS:**

For this rotation, the technical mentor will typically be a regional SRA. For Greater-than-green SDP findings, with guidance from the SRA, the candidate is expected to develop a Phase 3 analysis. Representative examples encompassing all of the above evaluation criteria shall be prepared by the technical mentor with approval of the home Branch Chief.

**OJT-GYO-ROT-5**  
**GYO On-the-Job Rotation Activity 5**

**TOPIC:** ROTATION TO OTHER PRA BRANCHES

**PURPOSE:** To give the analyst candidate experience with risk-informed activities in branches outside the candidate's home branch or home office. .

**PREREQUISITE:** Completion of all PRA Core Fundamental and PRA Fundamental activities.

**COMPETENCY**

**AREA:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** 1-2 months

**ACTIVITY:** The candidate will work in any one of the branches outside of the home branch or home office. Rotations can be in PRA branches in NRR, NRO, RES, or NMSS. .

**EVALUATION**

**CRITERIA:** At the completion of this rotation, the candidate shall meet with the rotational branch chief and technical mentor to discuss the following areas of assignment:

- Discuss the details of the work assignments.
- Discuss any challenges that the candidate had in working in the branch.
- Discuss lessons learned that have a direct bearing on the work the candidate has in his/her home branch.

Description of Specific GYO PRA Analyst Activities

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**TASKS:** Branch-specific tasks shall be assigned by the rotational branch chief and technical mentor. The candidate is responsible for all training activities while on rotation. At the end of this rotation, the candidate will make a presentation to members of the rotational branch, the home branch, and division management on work the candidate performed and lessons learned.



Description of Specific GYO PRA Analyst Activities

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**OJT-GYO-ROT-6**  
**GYO On-the-Job Rotation Activity 6**

<b>TOPIC:</b>	<b>ROTATION TO NRR/DIRS FOR MAINTENANCE RULE AND MSPI</b>
<b>PURPOSE:</b>	To give the analyst candidate experience with other agency risk-informed activities such as the Maintenance Rule and Mitigating Systems Performance Index (MSPI).
<b>COMPETENCY AREA:</b>	PRA IN REGULATION
<b>PREREQUISITE:</b>	Completion of PRA Fundamental Activities and ISA-GYO-2, "MSPI and NEI 99-02".
<b>LEVEL OF EFFORT:</b>	1-2 months (part-time)
<b>ACTIVITY:</b>	The candidate will work part-time in the Reactor Inspection Branch (IRIB) and/or the Performance Assessment Branch (IPAB) of DIRS. For the rotation to IRIB, the candidate should complete or be in the process of completing ISA-GYO-2, "MSPI and NEI 99-02".
<b>EVALUATION CRITERIA:</b>	<p>At the completion of this rotation, the candidate shall meet with the rotational branch chief and technical mentor to discuss the following areas of assignment:</p> <ul style="list-style-type: none"><li>• Discuss the details of the work assignments.</li><li>• Discuss any challenges that the candidate had in working in the branch.</li><li>• Discuss lessons learned that have a direct bearing on the work the candidate has in his/her home branch.</li></ul>

Description of Specific GYO PRA Analyst Activities

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**TASKS:** Branch-specific tasks shall be assigned by the rotational branch chief and technical mentor. The candidate is responsible for all training activities while on rotation. At the end of this rotation, the candidate will make a presentation to members of the rotational branch, the home branch, and division management on work the candidate performed and lessons learned.

**OJT-GYO-1**  
**GYO On-the-Job Training Activity 1**

<b>TOPIC:</b>	<b>CONDUCT A PHASE 3 SHUTDOWN RISK ASSESSMENT</b>
<b>PURPOSE:</b>	To give the analyst candidate experience in conducting a HQ SDP Phase 3 analysis the risk significance of a low power or shutdown finding.
<b>COMPETENCY AREA:</b>	PRA IN REGULATION
<b>PREREQUISITE:</b>	Completion of all PRA Core Fundamental and PRA Fundamental activities.
<b>LEVEL OF EFFORT:</b>	1 month
<b>ACTIVITY:</b>	For most potentially Greater-than-Green SDP findings that are at shutdown, analysts in the DRA PRA Operational Support branch (APOB) have been responsible for preparing the Phase 3 analysis. This activity is to give the analyst candidate experience in some of the unique technical issues encountered in performing a Phase 3 shutdown SDP assessment. It is intended that the candidate's work on the assessment to be on a part-time basis and should not interfere with other training activities or required classroom training. This activity should not start until the candidate has completed ISA-6, "Overview of Shutdown Risk" of the PRA Fundamental Activities group. The technical mentor for this activity will be an APOB shutdown subject matter expert. It is expected that the technical mentor will supervise the candidate in preparation of the Phase 3 analysis. The candidate will follow through the process by soliciting comments from reviewers (the DRA senior level advisor) and other stakeholders. Afterward, the candidate will deliver a Significance and

Description of Specific GYO PRA Analyst Activities

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Enforcement Review Panel (SERP) briefing to HQ office management and will participate in the panel meeting with the other stakeholders. It is expected that the candidate will participate at a regulatory conference, if necessary.

**EVALUATION****CRITERIA:**

At the completion of this activity, the candidate should demonstrate the following areas of competency:

- Understanding of thermodynamic conditions at the reactor core with regard to time-to-boil, cooling and vessel inventory.
- Understanding the state of various system interactions and configurations during the modeled condition.
- Understanding of human reliability analysis with respect to timing, dependencies, operator diagnosis, and actions taken.
- Understanding of procedures and unique conditions in the plant.
- Understanding the development of a Phase 3 SDP analysis.

**TASKS:**

A presentation of the Phase 3 analysis prepared by the candidate along with insights gained from the SERP meeting and input from the DRA senior level advisor will be made to the technical mentor and home Branch Chief for assessment.

**OJT-GYO-2**  
**GYO On-the-Job Training Activity 2**

**TOPIC:** WRITE A RISK-INFORMED SAFETY EVALUATION (SE)

**PURPOSE:** To give the analyst candidate experience in preparing a safety evaluation after review of a risk-informed request for licensing action.

**COMPETENCY**

**AREA:** PRA IN REGULATION

**PREREQUISITE:** Completion of all PRA Core Fundamental and classroom training in the PRA in Regulation series. The candidate also must possess a Reactor Technical Review qualification.

**LEVEL**

**OF EFFORT:** 2 months

**ACTIVITY:** The candidate will work closely with the technical mentor on preparing the response to any licensee risk-informed request for licensing action. This can include license amendments or review of vendor topical reports. Activities can include the preparation and resolution of Requests for Additional Information (RAIs), possible public meetings with licensees and stakeholders, and interface with other branches and/or offices.

**EVALUATION**

**CRITERIA:** At the completion of this activity, the candidate should demonstrate the following areas of competency:

- Application and interpretation of RG 1.200 and ANS/ASME quality standards for review of amendments.
- Interpretation of licensee peer review results.

Description of Specific GYO PRA Analyst Activities

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- Understanding supporting standards used for evaluation such as National Fire Protection Association (NFPA) Standard 805.
- Preparation of the regulatory and technical evaluation sections of a risk-informed SE.

**TASKS:**

A presentation of the SE prepared by the candidate along with insights gained will be made to the home Branch Chief for assessment.

## **ISA-GYO-1** **GYO Independent Study Activity 1**

**TOPIC:** **NFPA-805 REVIEW**

**PURPOSE:** The purpose of this activity is for the candidate to become familiar with the risk-informed license amendment request submittals made by licensees transitioning to the National Fire Protection Association (NFPA) Standard 805 (10 CFR 50.48(c)). Reliability and Risk Analysts must might be either engaged in review of license amendment requests or evaluate SDP analyses for plants transitioning to NFPA-805.

**PREQUISITE:** Completion of PRA Fundamental activities and EPRI/RES Fire PRA training. This activity should be completed prior to a rotation to NRR/DRA/AFPB.

**COMPETENCY**

**AREAS:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** 40 hours

**REFERENCES:**

- Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions of Plant-Specific Changes to the Licensing Basis", Rev. 1, November 2002
- Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants", May 2006
- Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities", Rev. 2, March 2009

Description of Specific GYO PRA Analyst Activities

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- NEI 04-02, “Guidance for Implementing a Risk- Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)”.
- NEI 00-01, “Guidance for Post Fire Safe Shutdown Circuit Analysis”.
- NFPA-805, List of Frequently Asked Questions (FAQ).
- At least one representative license amendment request for a transitioning plant along with RAI, licensee responses, and peer review comments.

**EVALUATION****CRITERIA:**

At the completion of this activity, the analyst should have a clear understanding of the various parts of a NFPA-805 license amendment request.

**TASKS:**

The student should self-study the references along with the interaction and guidance of the Technical Mentor. The areas that should be concentrated in this self-study are:

- The NFPA-805 transition process from the regulatory and industry perspective.
- Fire safe shutdown analysis.
- Cable hot shorts and spurious actuation.
- Fire PRA results.
- The peer review process.
- Fire vulnerabilities encountered.
- Modifications made by licensee to reduce baseline risk.



**ISA-GYO-2**  
**GYO Independent Study Activity 2**

**TOPIC:** MSPI AND NEI-99-02

**PURPOSE:** The purpose of this activity is for the candidate to become familiar with the concepts of the Mitigating Systems Performance Index (MSPI) program. The program, which is part of the Reactor Oversight Program, uses results from the licensee's active baseline risk assessment models which are often used for risk-informed licensing submittals. Although MSPI is not directly reviewed by the NRR Division of Risk Assessment, Reliability and Risk Analysts may be called upon by process owners to review and audit changes to the underlying licensee PRA models.

**PREQUISITE:** Completion of PRA Fundamental.

**COMPETENCY**

**AREAS:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** 40 hours

**REFERENCES:**

- NEI 99-02, "Reactor Oversight Process Performance Indicators".
- Inspection Manual Chapter IMC-0608, "Performance Indicator Program".
- Regulatory Guide (RG) 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

**EVALUATION**

**CRITERIA:** At the completion of this activity, the analyst should have a clear understanding of the MSPI program.

Description of Specific GYO PRA Analyst Activities

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**TASKS:** The student should self-study the references along with the interaction and guidance of the Technical Mentor. The areas that should be concentrated in this self-study are:

- Methods of calculation of Unreliability (URI) and Unavailability (UAI) indices.
- Use of Birnbaum importance ranking.
- Concerns over PRA quality in the underlying PRA analysis.
- Review of reports from Consolidated Data Entry (CDE) from the Institute of Nuclear Power Operations (INPO).

Description of Specific GYO PRA Analyst Activities

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**ISA-GYO-3**  
**GYO Independent Study Activity 3**

**TOPIC:** **SAMGs**

**PURPOSE:** The purpose of this activity is for the candidate to become familiar with the Severe Accident Management Guidelines. Reliability and Risk Analysts need to become familiar with guidance that licensees will take for events occurring past core damage. In light of recent events, SAMGs might become standalone procedures.

**PREQUISITE:** Completion of PRA Fundamentals.

**COMPETENCY**

**AREAS:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** TBD

**REFERENCES:**

- TBD

**EVALUATION**

**CRITERIA:** TBD.

**TASKS:** TBD

Description of Specific GYO PRA Analyst Activities

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**ISA-GYO-4**  
**GYO Independent Study Activity 4**

**TOPIC:** SAMA

**PURPOSE:** The purpose of this activity is for the candidate to become familiar with the Severe Accident Mitigation Alternatives (SAMA) used by licensees in their license extension applications. Reliability and Risk Analysts need to become familiar with license renewal activities which use a risk-informed approach.

**PREQUISITE:** Completion of PRA Fundamentals.

**COMPETENCY**

**AREAS:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** TBD

**REFERENCES:**

- NUREG-1437, "Generic Environmental Impact Statement For License Renewal Of Nuclear Plants".

**EVALUATION**

**CRITERIA:** TBD.

**TASKS:** TBD

**ISA-GYO-5**  
**GYO Independent Study Activity 5**

**TOPIC:** REGULATORY FRAMEWORK FOR NEW REACTOR PRA (OPTIONAL)

**PURPOSE:** The purpose of this activity is to become familiar with the regulatory framework for new reactor PRA. Reliability and risk analysts must understand the risk terminologies and philosophies used by the NRC in the conduct of its regulatory activities.

**PREQUISITE:** Completion of PRA Fundamentals.

**COMPETENCY**

**AREAS:** PRA IN REGULATION

**LEVEL**

**OF EFFORT:** 40 hours

**REFERENCES:**

- Maintenance of records, making of reports; 10 CFR 50.71, subsections (h)(1) to (h)(3) (2007)
- Contents of applications; technical information; [10 CFR 52.47](#), subsections (a)(8), (a)(23), and (a)(27) (2009)
- Contents of applications, technical information in final safety analysis report; [10 CFR 52.79](#), subsections (a)(17), (a)(38), (a)(46), and (d)(1) (2011)
- Safety Goals for the Operations of Nuclear Power Plants: Policy Statement, [51 Fed. Reg. 30028](#) (Aug. 21, 1986)
- Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants, [50 Fed. Reg. 32138](#) (Aug. 8, 1985)

Description of Specific GYO PRA Analyst Activities

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- Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities; Final Policy Statement, [60 Fed. Reg. 42622](#) (Aug. 16, 1995)
- [Regulatory Guide \(RG\) 1.174](#), An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions of Plant-Specific Changes to the Licensing Basis, Rev. 1, Nov. 2002
- Regulatory Guide (RG) 1.206, Combined License Applications for Nuclear Power Plants, Sections [C.I.19](#) (Probabilistic Risk Assessment and Severe Accident Evaluation) and the last page of [C.III.1](#) (Information Needed for a Combined License Application Referencing a Certified Design), June 2007
- Standard Review Plan ([SRP](#) [Section 19.0](#), Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors, Rev. 2, June 2007

**EVALUATION**

**CRITERIA:** At the completion of this activity, you should have a clear understanding of the reliability and risk analyst's role in new reactor activities.

**TASKS:** The candidate must be able to:

- Discuss the Commission policy statement regarding expanding the use of PRA in regulatory matters.
- Discuss the quantitative health objectives (QHO) and subsidiary goals.
- Discuss the requirements for new reactor design certification (DC) and combined license (COL) applicants, both before and after licensing.
- Discuss the scope of PRA information that is requested in COL applications.
- Discuss the acceptance criteria in SRP 19.0.
- Discuss the five key principles of risk-informed decision making outlined in RG 1.174.

**Enclosure 4**  
**Forms**





## "Grow Your Own" PRA Analyst Qualification and Training Program Equivalency Justification Form

*Please fill out a separate individual form for each waiver or equivalency.*

<b>Candidate's Name</b>	<b>Candidate's Home Branch</b>
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<b>Training Activity</b>	<b>Training Activity Description</b>	<b>Waive or Replace? (W/R)</b>	<b>Waiver Justification or Replacement Training Activity</b>

### Approvals

<b>Branch Chief Name</b>	<b>Branch Chief Signature</b>	<b>Manager Name</b>	<b>Manager Signature</b>
<b>Date Signed</b>	<b>Date Signed</b>		