Boiling Water Reactor Owners Group Project Number 691
Pressurized Water Reactor Owners Group Project Number 694

December 19, 2006

OG-06-412

United States Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555-0001

Attention: Document Control Desk

Subject: Pressurized Water Reactor Owners Group / Boiling Water Reactor Owners Group
For Information Only – WCAP-16678-NP, Revision 0, "Project To Update Section 2, Generic Knowledge And Abilities, of NUREG-1122 and NUREG-1123" (PA-OSC-0139)

References: OG-2006-24, "Summary of NRC Public Meeting Regarding Training Working Group Program, NRC KA Catalog Revision (PA-OSC-0139)", January 17, 2006

Enclosed please find five (5) copies of WCAP-16678-NP, Revision 0, "Project To Update Section 2, "Generic Knowledge And Abilities" of NUREG-1122 and NUREG-1123". The PWR and BWR Owners Groups are providing these documents for information only. These documents are not being formally submitted under the NRC's process for review and approval of topical reports. As such, no review fees are expected and no SER is being requested.

WCAP-16678 provides the recommended revision to NUREG-1122, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors and NUREG-1123, Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors".

The PWROG Training Working Group and the BWROG NUREG 1123 Committee recommends that the attached document replace the existing material in Section 2.0 of the Knowledge and Abilities Catalog. Also note that this WCAP will be discussed at the public meeting scheduled for November 29, 2006 in Rockville, MD.

Per the referenced letter, the NRC requested that the joint Owners Group Program include several additional KA's (outside the scope of Section 2.0 of the Catalog) in the final Importance to Safety Rating Survey. The results of the survey are included in WCAP-16678; however, the joint Owners Group Training Group makes no recommendation with respect to the inclusion of those KA's in the proposed NUREG revisions.

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D048

If you have any questions regarding the attached document or the contents of this letter, please contact Christine DiMuzio at 412-374-5680 or any of the undersigned.

Regards,

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WCAP-16678-NP
Revision 0

November 2006

Recommended Revision to Section 2, "Generic Knowledges and Abilities," of NUREG-1122 and NUREG-1123, Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized and Boiling Water Reactors

Westinghouse

WCAP-16678-NP
Revision 0

Recommended Revision to Section 2, "Generic Knowledges and Abilities," of NUREG-1122 and NUREG-1123, Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized and Boiling Water Reactors

John Hilton
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November 2006

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This work was performed under PWROG Project Number PA-OSC-139.

*Electronically approved records are authenticated in the electronic document management system.

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Pressurized Water Reactor Owners Group Member Participation* for PWROG Project PA-OSC-139			
		Participant	
Utility Member	Plant Site(s)	Yes	No
AmerenUE	Callaway (W)	X	
American Electric Power	D.C. Cook 1&2 (W)	X	
Arizona Public Service	Palo Verde Unit 1, 2, & 3 (CE)	X	
Constellation Energy Group	Calvert Cliffs 1 & 2 (CE)	X	
Constellation Energy Group	Ginna (W)	X	
Dominion Connecticut	Millstone 2 (CE)	X	
Dominion Connecticut	Millstone 3 (W)	X	
Dominion Kewaunee	Kewaunee (W)	X	
Dominion VA	North Anna 1 & 2, Surry 1 & 2 (W)	X	
Duke Energy	Catawba 1 & 2, McGuire 1 & 2 (W), Oconee 1, 2, 3 (B&W)	X	
Entergy Nuclear Northeast	Indian Point 2 & 3 (W)	X	
Entergy Operations South	Arkansas 2, Waterford 3 (CE), Arkansas 1 (B&W)	X	
Exelon Generation Co. LLC	Braidwood 1 & 2, Byron 1 & 2 (W), TMI 1 (B&W)	X	
FirstEnergy Nuclear Operating Co	Beaver Valley 1 & 2 (W), Davis-Besse (B&W)	X	
Florida Power & Light Group	St. Lucie 1 & 2 (CE)	X	
Florida Power & Light Group	Turkey Point 3 & 4, Seabrook (W)	X	
Nuclear Management Company	Prairie Island 1&2, Pt. Beach 1&2 (W)	X	
Nuclear Management Company	Palisades (CE)	X	
Omaha Public Power District	Fort Calhoun (CE)	X	
Pacific Gas & Electric	Diablo Canyon 1 & 2 (W)	X	
Progress Energy	Robinson 2, Shearon Harris (W), Crystal River 3 (B&W)	X	
PSEG - Nuclear	Salem 1 & 2 (W)	X	
Southern California Edison	SONGS 2 & 3 (CE)	X	
South Carolina Electric & Gas	V.C. Summer (W)	X	
So. Texas Project Nuclear Operating Co.	South Texas Project 1 & 2 (W)	X	
Southern Nuclear Operating Co.	Farley 1 & 2, Vogtle 1 & 2 (W)	X	
Tennessee Valley Authority	Sequoyah 1 & 2, Watts Bar (W)	X	
TXU Power	Comanche Peak 1 & 2 (W)	X	
Wolf Creek Nuclear Operating Co.	Wolf Creek (W)	X	

* Project participants as of the date the final deliverable was completed. On occasion, additional members will join a project. Please contact the PWR Owners Group Program Management Office to verify participation before sending this document to participants not listed above.

Pressurized Water Reactor Owners Group International Member Participation* for PWROG Project PA-OSC-139			
		Participant	
Utility Member	Plant Site(s)	Yes	No
British Energy	Sizewell B	X	
Electrabel (Belgian Utilities)	Doel 1, 2 & 4, Tihange 1 & 3	X	
Kansai Electric Co., LTD	Mihama 1, Ohi 1 & 2, Takahama 1 (W)	X	
Korea Hydro & Nuclear Power Corp.	Kori 1, 2, 3 & 4 Yonggwang 1 & 2 (W)	X	
Korea Hydro & Nuclear Power Corp.	Yonggwang 3, 4, 5 & 6 Ulchin 3, 4 , 5 & 6(CE)	X	
Nuklearna Electrarna KRSKO	Krsko (W)	X	
Nordostschweizerische Kraftwerke AG (NOK)	Beznau 1 & 2 (W)	X	
Ringhals AB	Ringhals 2, 3 & 4 (W)	X	
Spanish Utilities	Asco 1 & 2, Vandellos 2, Almaraz 1 & 2 (W)	X	
Taiwan Power Co.	Maanshan 1 & 2 (W)	X	
Electricite de France	54 Units	X	

* This is a list of participants in this project as of the date the final deliverable was completed. On occasion, additional members will join a project. Please contact the PWR Owners Group Program Management Office to verify participation before sending documents to participants not listed above.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 1-1

2 BACKGROUND 2-1

3 DEVELOPMENT OF NEW AND REVISED KAS 3-1

4 METHODS 4-1
- 4.1 INITIAL SURVEY 4-1
  - 4.1.1 Respondents 4-1
  - 4.1.2 Survey Administration 4-1
  - 4.1.3 Survey Instrument 4-1
- 4.2 SECOND SURVEY 4-2
  - 4.2.1 Respondents 4-2
  - 4.2.2 Survey Administration 4-2
  - 4.2.3 Survey Instrument 4-2

5 FINAL RESULTS 5-1

ATTACHMENT 1 FINAL RECOMMENDED REVISION TO NUREGS 1122 & 1123 6-1

ATTACHMENT 2 INITIAL SURVEY REPORT & RECOMMENDATIONS 7-1

ATTACHMENT 3 SECOND SURVEY REPORT & RECOMMENDATIONS 8-1

ATTACHMENT 4 SUMMARY OF TELECONFERENCE WITH NRC ON FEBRUARY 16, 2006 9-1

1 EXECUTIVE SUMMARY

The Pressurized Water Reactor Owners Group (PWROG) Training Working Group (TWG) initiated a project (PA-OSC-139) to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (KAs) listed in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2). The results of the survey indicated that it would be worthwhile to update Section 2 of the Catalog to (1) improve the interpretability of several confusing KAs; (2) increase the number of KAs in Section 2 that are applicable to the reactor operator (RO) job position; and (3) enhance the difficulty and applicability of the KAs in Subsection 2.3, Radiation Protection, to licensed duties. Therefore, the PWROG TWG developed a set of new and revised KAs to replace the KAs in Section 2 that the survey had shown were problematic and planned to conduct a second survey to obtain "importance to safety" ratings for the new and revised KAs. In addition, the NRC staff requested the PWROG TWG to include 33 additional KAs in the second survey to obtain importance ratings for them. These KAs would be added to the E/APEs in Section 4 of the Catalog and pertain to degraded voltage situations.

A second survey was administered. One hundred and seventy-one participants completed the survey. Participants for the survey included personnel from PWR and BWR facilities along with NRC examiners.

Ratings provided by different groups of participants were analyzed and no systematic differences were found in the importance ratings provided by different groups of participants.

2 BACKGROUND

NUREG-1122 and NUREG-1123 (the Catalogs) were initially developed in 1985 by a working group comprised of licensed Reactor Operators (ROs), Senior Reactor Operators (SROs), and NRC-certified operator licensing examiners. The original Catalogs were developed using the Institute of Nuclear Power Operations' (INPO) generic Job and Task Analysis (JTA). INPO developed the generic JTA in an effort to provide a common starting point for member utilities to develop their site-specific JTAs. The NRC impaneled industry job incumbents (ROs and SROs), augmented by NRC-certified licensing examiners, to develop the KAs using a consensus process and to rate the "importance to safety" of each KA.

In 1996, the NRC updated the Catalogs and made extensive changes to Section 2. These changes included: (1) moving many of the previous system generic KAs into Section 2 and revising them for plant-wide applicability; (2) reorganizing Section 2 into four subsections and establishing sampling requirements for the four subsections; (3) linking the KAs to the applicable 10 CFR 55 requirements; and (4) adding new plant-wide generic KAs. The NRC obtained new "importance to safety" ratings for the new and revised KAs, but retained the importance ratings from Rev. 0 of the Catalogs for the KAs that were not changed.

The industry has continued to accumulate operating experience and "lessons learned" over the past 20 years, as well as during the past 10 years since Rev 2 to NUREG-1122 and NUREG-1123 were published. Therefore, one purpose of this project is to update the "importance to safety" ratings in the current Catalogs, as well as determine whether there are new KAs that should be added.

In addition, since the Catalogs were last revised, the NRC has changed its regulations and now permits its licensees to develop operator licensing examinations, rather than restricting exam development to NRC-certified licensing examiners. In order to ensure consistency in the exam development process when implemented by the utilities, the NRC also revised NUREG-1021, *Operator Licensing Examiner Standards for Power Reactors*. The revised examiner standards decrease the latitude given to exam developers in choosing the KAs to be tested in an exam and require test items to be more closely aligned with the content of the KAs. However, it has been the experience of the PWROG TWG members that some of the KAs in Section 2 are difficult to interpret, some are outdated, and some are inappropriate for licensing examinations. Therefore, it is difficult to develop written exam questions based on these KAs that are acceptable to NRC reviewers. As a result, both utility and NRC resources are wasted in the rework required to develop acceptable exams.

The Pressurized Water Reactor Owners Group (PWROG) Training Working Group (TWG) initiated a project to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (KAs) in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The KAs in Section 2 were selected for review because industry examiner personnel have described them as the greatest source of confusion in NUREG-1122 (the Catalog) and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements.

A survey was administered and 129 participants completed the survey. The results of the initial survey indicated that –

- The importance ratings for 22% of the current KAs in Section 2 showed substantial variability among the raters, indicating that these KAs should be updated or clarified;
- There are many more KAs in Section 2 that are appropriate for testing in an SRO-level exam than in an RO-level exam, indicating that exam developers may have difficulties in selecting the required number of KAs from Section 2 to be tested in initial licensing exams;
- The knowledge or ability required is different for the RO and SRO jobs in 45% of the KAs, indicating that revisions to the KAs may be warranted to clarify their unique applicability to the two job levels; and
- The KAs in Subsection 2.3, Radiation Protection, appear to be particularly difficult to interpret and use as the basis for exam questions that are applicable to licensed operators' job requirements.

These results indicated that it would be worthwhile to update Section 2. Therefore, the PWROG TWG held a workshop to review the information collected from the survey and develop recommendations for adding, deleting, and revising the KAs to increase their relevance to today's operating environment.

3 DEVELOPMENT OF NEW AND REVISED KAS

Proposed revisions to Section 2 were developed in several steps. First, a subgroup of PWROG TWG members who have been assigned to monitor the progress of this project were divided at random into two approximately equal working groups and assigned specific KAs from the first survey to review. Over the first 1.5 days of the workshop, the two groups reviewed the information provided and developed proposed revisions to the KAs. Additional reference materials used by the groups included Chapter 10 of the Code of Federal Regulations, Rev.s 0 and 2 of NUREG-112, and Rev. 9 of NUREG-1021. An NRC representative was also present and participated as a member of one of the working groups.

On the afternoon of the second day of the workshop, the results from the two working groups were presented to all PWROG TWG members who attended the meeting for additional review, revision, and concurrence. The PWROG TWG members present also reviewed the survey respondents' recommendations for new KAs. Finally, the PWROG TWG reviewed all of the comments provided by the survey respondents on all of the KAs to determine whether other KAs could be improved.

A report was developed in August 2005 (Attachment 2) that summarized the survey results and recommendations for revising and adding KAs to Section 2, after a second survey was completed to obtain importance ratings for the proposed revised and new KAs. A meeting was held with the NRC in Rockville, Maryland in October 2005 to present the findings of the survey. The NRC indicated that they did not believe that the proposed changes were of sufficient significance to warrant a revision to the Catalog at that time. A subsequent meeting was held in January 2006 with the NRC to further address their concerns and answer questions. In the interim, the Boiling Water Reactor (BWR) Owners' Group (BWROG) committed to this project, endorsing an update to Section 2 of NUREG-1123, and participated in the January 2006 meeting. During the January 2006 meeting, the NRC required some new KAs to be included in the second survey and also requested that 33 KAs related to degraded voltage be added to the survey and evaluated for possible inclusion in Section 4 of the Catalog. A final teleconference was conducted on February 16, 2006, in which the NRC gave approval for the second validation survey and continuation of the project.

The name of the Westinghouse Owners Group (WOG) was changed to Pressurized Water Reactor Owners Group (PWROG) early in 2006. PWROG TWG representatives along with BWROG representatives met on the afternoon of August 28 and morning of August 29, 2006 and reviewed the results of the second survey (Attachment 3). Final recommendations were made and put into a final format for NUREG 1122 & 1123 (Attachment 1).

4 METHODS

4.1 INITIAL SURVEY

4.1.1 Respondents

The PWROG TWG sought the largest possible participation in the survey among the utilities that are licensed to operate a PWR and sent a request for participation to each of its members, as well as to members of the Babcock and Wilcox Owners Group. The request asked for volunteers to participate in the survey who (1) currently hold or previously held a PWR license, (2) had access to the internet to complete the survey, and (3) had available approximately 4 hours of time to complete the survey. In addition, participation from NRC licensing examiners in each NRC Region was also sought.

4.1.2 Survey Administration

The survey was administered electronically via the World Wide Web in order to (1) permit respondents to complete the survey at their own pace, (2) reduce administration time and data input costs, and (3) maintain control over access to the survey and results.

The point-of-contact from each site that agreed to participate emailed a list of volunteer participants to the survey administrators. The administrators then contacted each volunteer and provided him or her with a unique user name and password for accessing the survey website. Only the survey administrators were able to link responses to the individual participants. Responses were collected between October 2004, and April 2005.

4.1.3 Survey Instrument

The instructions for completing the survey that were provided to the participants when they logged into the survey website can be seen in Attachment 2.

The initial survey questions requested information about each respondent, including:

- The NSSS vendor type of the PWR unit(s) for which they are licensed (or, in the case of those who are not currently licensed, the NSSS vendor types with which they are most familiar);
- Whether they were licensed at the time of completing the survey and, if so, the type of license held (i.e., RO or SRO);
- The number of years they held an RO and/or SRO license;
- Their job duties at the time of completing the survey;
- The amount of time they had spent standing watch, on shift, in the past 5 years; and
- Whether they had ever developed or reviewed an operator licensing exam.

The respondents were then asked to answer a series of questions about each of the 129 KAs in Section 2. For each KA, respondents were asked the following questions:

In your opinion, how important is it for ROs and SROs to master this KA in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);

- In your opinion, which of the following exams should include questions that test for mastery of this KA? (Response options were the site-specific RO licensing exam; site-specific SRO licensing exam; General Fundamentals Exam; Other exams such as GET or Radworker training; and don't know); and

- Is the knowledge or ability required by this KA the same for ROs and SROs? (Response options were yes, no, and don't know).

- Text fields were also provided for respondents to offer explanatory comments for their responses or additional information. The respondents also were asked for any suggestions they had for revising each KA. At the end of the survey, the respondents were asked to list any KAs that they believed should be added to the current KA Catalog in Section 2 and the job position (RO, SRO, or both) to which the KA would apply.

4.2 SECOND SURVEY

4.2.1 Respondents

All participants from the first survey (~ 129) were sent a request to participate in this second survey. In addition, the BWROG sent out a request asking for volunteers to participate in the survey who (1) currently hold or previously held a BWR license, (2) had access to the internet to complete the survey, and (3) had available approximately 45 minutes of time to complete the survey. 171 participants completed the survey. The breakdown is as follows: 59% PWR, 34% BWR, 7% other.

4.2.2 Survey Administration

The survey was administered electronically via the World Wide Web in order to (1) permit respondents to complete the survey at their own pace, (2) reduce administration time and data input costs, and (3) maintain control over access to the survey and results. The survey administrators contacted each volunteer and provided him or her with a unique user name and password for accessing the survey website. Only the survey administrators were able to link responses to the individual participants. Responses were collected between April 3, 2006 and June 5, 2006.

4.2.3 Survey Instrument

The instructions for completing the survey, which were provided to the participants when they logged into the survey website, can be seen in Attachment 3.

The initial survey questions requested information about each respondent, including:

- The reactor design (BWR vs. PWR) for which they hold a currently active license or for which they were previously licensed;
- The NSSS vendor type of the PWR unit(s) for which they are licensed (or, in the case of those who are not currently licensed, the NSSS vendor types with which they are most familiar);
- The type of BWR unit for which they are licensed (or, in the case of those who are not currently licensed, the type with which they are most familiar);
- Whether they were licensed at the time of completing the survey and, if so, the type of license held (i.e., RO or SRO);
- The number of years they held an RO and/or SRO license;
- Their job duties at the time of completing the survey;
- The amount of time they had spent standing watch, on shift, in the past 5 years; and
- Whether they had ever developed or reviewed an operator licensing exam.

The respondents were then asked to answer two questions for each of the 87 KAs. For each KA, respondents were asked the following questions:

- In your opinion, how important is it for ROs to master this KA in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);
- In your opinion, how important is it for SROs to master this KA in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);

For two KAs (KA 50, "Knowledge of site corrosion processes, such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc." and KA 51, "Knowledge of water chemistry controls, such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc."), respondents were also asked to answer:

- In your opinion, which of the following exams should include questions that test for mastery of this KA? (Response options were the site-specific RO licensing exam; site-specific SRO licensing exam; General Fundamentals Exam; Other exams such as GET or Radworker training; and don't know).

Text fields were also provided for respondents to offer explanatory comments for their responses or additional information.

5 FINAL RESULTS

1. The proposed changes to Generic Section 2 Knowledge and Abilities Catalog for Nuclear Plant Operators: Pressurized Water Reactors, NUREG 1122 is included in Attachment 1.

2. The proposed changes to Generic Section 2 Knowledge and Abilities Catalog for Nuclear Plant Operators: Boiling Water Reactors, NUREG 1123 is included in Attachment 1.

3. Results, methodology, & recommendations from first survey are included in Attachment 2.

4. Results, methodology & recommendations from second survey are included in Attachment 3.

5. Telecon meeting minutes of February 16, 2006 with the NRC is included in Attachment 4.

ATTACHMENT 1
FINAL RECOMMENDED REVISION TO NUREGS 1122 & 1123

Recommended Revision to NUREG 1122, Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors

Two new statements added for clarification

1.13.3 Technical Requirements Manual (TRM) - For the purpose of this catalog, K/A's that reference Technical Specifications may include the Technical Requirements Manual, where applicable.

1.13.4 K/A Clarifying Examples – K/A's that include the words 'such as', list suggested topical areas as examples and are not intended to be all inclusive.

2.0 GENERIC KNOWLEDGES AND ABILITIES

2.1 Conduct of Operations

2.1.1 **Knowledge of conduct of operations requirements.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.8 SRO 4.2

2.1.2 **Knowledge of operator responsibilities during all modes of plant operation.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 4.1 SRO 4.4

2.1.3 **Knowledge of shift or short-term relief turnover practices.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7 SRO 3.9

2.1.4 **Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.**
(CFR: 41.10 / 43.1 / 43.2)
IMPORTANCE RO 3.3 SRO 3.8

2.1.5 **Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 2.9 * SRO 3.9

2.1.6 **Ability to manage the control room crew during plant transients.**
(CFR: 41.10 / 43.5 / 45.12 / 45.13)
IMPORTANCE RO 3.8* SRO 4.8

2.1.7 **Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.**
(CFR: 41.5 / 43.5 / 45.12 / 45.13)
IMPORTANCE RO 4.4 SRO 4.7

2.1 Conduct of Operations (continued)

2.1.8 **Ability to coordinate personnel activities outside the control room.**
(CFR: 41.10 / 43.1 / 45.5 / 45.12 / 45.13)
IMPORTANCE RO 3.4 SRO 4.1

2.1.9 **Ability to direct personnel activities inside the control room.**
(CFR: 41.10 / 43.1 / 45.5 / 45.12 / 45.13)
IMPORTANCE RO 2.9* SRO 4.5

2.1.10 **Moved to 2.2.38**

2.1.11 **Moved to 2.2.39**

2.1.12 **Moved to 2.2.40**

2.1.13 **Knowledge of facility requirements for controlling vital/controlled access.**
(CFR: 41.10 / 43.5 / 45.9 / 45.10)
IMPORTANCE RO 2.5 SRO 3.2

2.1.14 **Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.1 SRO 3.1

2.1.15 **Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 2.7 SRO 3.4

2.1.16 **Deleted**

2.1.17 **Ability to make accurate, clear, and concise verbal reports.**
(CFR: 41.10 / 43.1 / 45.12 / 45.13)
IMPORTANCE RO 3.9 SRO 4.0

2.1 Conduct of Operations (continued)

2.1.18 **Ability to make accurate, clear, and concise logs, records, status boards, and reports.**
(CFR: 41.10 / 43.1 / 45.12 / 45.13)
IMPORTANCE RO 3.6 SRO 3.8

2.1.19 **Ability to use plant computers to evaluate system or component status.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 3.9 SRO 3.8

2.1.20 **Ability to interpret and execute procedure steps.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 4.6 SRO 4.6

2.1.21 **Ability to verify the controlled procedure copy.**
(CFR: 41.10 / 43.5 / 45.10 / 45.13)
IMPORTANCE RO 3.5* SRO 3.6*

2.1.22 **Revised & Moved to 2.2.35**

2.1.23 **Ability to perform specific system and integrated plant procedures during all modes of plant operation.**
(CFR: 41.10 / 43.5 / 45.2 / 45.6)
IMPORTANCE RO 4.3 SRO 4.4

2.1.24 **Moved to 2.2.41**

2.1.25 **Ability to interpret reference materials, such as graphs, curves, tables, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.9 SRO 4.2

2.1.26 **Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 3.4 SRO 3.6

2.1 Conduct of Operations (continued)

2.1.27 **Knowledge of system purpose and/or function.**
(CFR: 41.7 / 43.1)
IMPORTANCE RO 3.9 SRO 4.0

2.1.28 **Knowledge of the purpose and function of major system components and controls.**
(CFR: 41.7 / 43.1)
IMPORTANCE RO 4.1 SRO 4.1

2.1.29 **Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.**
(CFR: 41.10 / 43.1 / 45.1 / 45.12)
IMPORTANCE RO 4.1 SRO 4.0

2.1.30 **Ability to locate and operate components, including local controls.**
(CFR: 41.7 / 43.1 / 45.7)
IMPORTANCE RO 4.4 SRO 4.0

2.1.31 **Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.6 SRO 4.3

2.1.32 **Ability to explain and apply system limits and precautions.**
(CFR: 41.10 / 43.2 / 45.12)
IMPORTANCE RO 3.8 SRO 4.0

2.1.33 **Moved to 2.2.42**

2.1 Conduct of Operations (continued)

2.1.34 **Knowledge of primary and secondary plant chemistry limits.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 2.7 SRO 3.5

2.1.35 **Knowledge of the fuel-handling responsibilities of SROs.**
(CFR: 41.10 / 43.7)
IMPORTANCE RO 2.2 SRO 3.9

2.1.36 **Knowledge of procedures and limitations involved in core alterations.**
(CFR: 41.10 / 43.6 / 45.7)
IMPORTANCE RO 3.0 SRO 4.1

2.1.37 **Knowledge of procedures, guidelines, or limitations associated with reactivity management.**
(CFR: 41.1 / 43.6 / 45.6)
IMPORTANCE RO 4.3 SRO 4.6

2.1.38 **Knowledge of the station's requirements for verbal communications when implementing procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7* SRO 3.8

2.1.39 **Knowledge of conservative decision making practices.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.3

2.1.40 **Knowledge of refueling administrative requirements.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.8 SRO 3.9

2.1.41 **Knowledge of the refueling process.**
(CFR: 41.2 / 41.10 / 43.6 / 45.13)
IMPORTANCE RO 2.8 SRO 3.7

2.1 Conduct of Operations (continued)

2.1.42 **Knowledge of new and spent fuel movement procedures.**
(CFR: 41.10 / 43.7 / 45.13)
IMPORTANCE RO 2.5 SRO 3.4

2.1.43 **Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc.**
(CFR: 41.10 / 43.6 / 45.6)
IMPORTANCE RO 4.1 SRO 4.3

2.1.44 **Knowledge of RO duties in the control room during fuel handling such as responding to alarms from the fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.**
(CFR: 41.10 / 43.7 / 45.12)
IMPORTANCE RO 3.9 SRO 3.8

2.1.45 **Ability to identify and interpret diverse indications to validate the response of another indicator.**
(CFR: 41.7 / 43.5 / 45.4)
IMPORTANCE RO 4.3 SRO 4.3

2.2 Equipment Control

2.2.1 **Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.**
(CFR: 41.5 / 41.10 / 43.6 / 45.1)
IMPORTANCE RO 4.5 SRO 4.4

2.2.2 **Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.**
(CFR: 41.6 / 41.7 / 43.1 / 45.2)
IMPORTANCE RO 4.6 SRO 4.1

2.2.3 (multi-unit license) **Knowledge of the design, procedural, and operational differences between units.**
(CFR: 41.5 / 43.1 / 45.12)
IMPORTANCE RO 3.8 SRO 3.9

2.2.4 (multi-unit license) **Ability to explain the variations in control board layouts, systems, instrumentation and procedural actions between units at a facility.**
(CFR: 41.10 / 43.1 / 45.1 / 45.13)
IMPORTANCE RO 3.6 SRO 3.6

2.2.5 **Knowledge of the process for making design or operating changes to the facility.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.2 SRO 3.2

2.2.6 **Knowledge of the process for making changes to procedures.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.0 SRO 3.6

2.2.7 **Knowledge of the process for conducting special or infrequent tests.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.9 SRO 3.6

2.2.8 **Deleted**

2.2.9 **Deleted**

2.2 Equipment Control (continued)

2.2.10 **Deleted**

2.2.11 **Knowledge of the process for controlling temporary design changes.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.3 SRO 3.3

2.2.12 **Knowledge of surveillance procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7 SRO 4.1

2.2.13 **Knowledge of tagging and clearance procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 4.1. SRO 4.3

2.2.14 **Knowledge of the process for controlling equipment configuration or status.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.2.15 **Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.2.16 **Deleted**

2.2.17 **Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.8

2.2 Equipment Control (continued)

2.2.18 **Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.9

2.2.19 **Knowledge of maintenance work order requirements.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.3 SRO 3.4

2.2.20 **Knowledge of the process for managing troubleshooting activities.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.8

2.2.21 **Knowledge of pre- and post-maintenance operability requirements.**
(CFR: 41.10 / 43.2)
IMPORTANCE RO 2.9 SRO 4.1

2.2.22 **Knowledge of limiting conditions for operations and safety limits.**
(CFR: 41.5 / 43.2 / 45.2)
IMPORTANCE RO 4.0 SRO 4.7

2.2.23 **Ability to track Technical Specification limiting conditions for operations.**
(CFR: 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.1 SRO 4.6

2.2.24 **Ability to analyze the effect of maintenance activities on the status of limiting conditions for operations.**
(CFR: 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.0 SRO 4.2

2.2.25 **Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.**
(CFR: 41.5 / 41.7 / 43.2)
IMPORTANCE RO 3.2 SRO 4.2

2.2 Equipment Control (continued)

2.2.26 **Moved to 2.1.40**

2.2.27 **Moved to 2.1.41**

2.2.28 **Moved to 2.1.42**

2.2.29 **Moved to 2.1.35**

2.2.30 **Moved to 2.1.44**

2.2.31 **Revised & Moved to 2.1.36**

2.2.32 **Deleted**

2.2.33 **Deleted**

2.2.34 **Revised & Moved to 2.1.43**

2.2.35 **Ability to determine Technical Specification Mode of Operation.**
(CFR: 41.7 / 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.6 SRO 4.5

2.2.36 **Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.1 SRO 4.2

2.2 Equipment Control (continued)

2.2.37 **Ability to determine operability and/or availability of safety related equipment.**
(CFR: 41.7 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.6

2.2.38 **Knowledge of conditions and limitations in the facility license.**
(CFR: 41.7 / 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.6 SRO 4.5

2.2.39 **Knowledge of less than or equal to one hour Technical Specification action statements for systems.**
(CFR: 41.7 / 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.9 SRO 4.5

2.2.40 **Ability to apply Technical Specifications for a system.**
(CFR: 41.10 / 43.2 / 43.5 / 45.3)
IMPORTANCE RO 3.4 SRO 4.7

2.2.41 **Ability to obtain and interpret station electrical and mechanical drawings.**
(CFR: 41.10 / 45.12 / 43.1 / 45.13)
IMPORTANCE RO 3.5 SRO 3.9

2.2.42 **Ability to recognize system parameters that are entry-level conditions for Technical Specifications.**
(CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)
IMPORTANCE RO 3.9 SRO 4.6

2.2.43 **Knowledge of the process used to track inoperable alarms.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.0 SRO 3.3

2.2.44 **Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.**
(CFR: 41.5 / 43.5 / 45.12)
IMPORTANCE RO 4.2 SRO 4.4

2.3 Radiation Control

2.3.1 **Deleted**

2.3.2 **Deleted**

2.3.3 **Deleted**

2.3.4 **Knowledge of radiation exposure limits under normal or emergency conditions.**
(CFR: 41.12 / 43.4 / 45.10)
IMPORTANCE RO 3.2 SRO 3.7

2.3.5 **Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.**
(CFR: 41.12 / 43.4 / 45.9)
IMPORTANCE RO 2.9 SRO 2.9

2.3.6 **Ability to approve release permits.**
(CFR: 41.13 / 43.4 / 45.10)
IMPORTANCE RO 2.0 SRO 3.8

2.3.7 **Ability to comply with radiation work permit requirements during normal or abnormal conditions.**
(CFR: 41.12 / 43.5/ 45.10)
IMPORTANCE RO 3.5 SRO 3.6

2.3.8 **Deleted**

2.3.9 **Deleted**

2.3.10 **Deleted**

2.3 Radiation Control (continued)

2.3.11 **Ability to control radiation releases.**
(CFR: 41.11 / 43.4 / 45.10)
IMPORTANCE RO 3.8 SRO 4.3

2.3.12 **Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.**
(CFR: 41.12 / 43.4. / 45.9 / 45.10)
IMPORTANCE RO 3.2 SRO 3.7

2.3.13 **Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.**
(CFR: 41.12 / 43.4 / 45.9 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

2.3.14 **Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.**
(CFR: 41.12 / 43.4 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

2.3.15 **Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.**
(CFR: 41.12 / 43.4 / 45.9)
IMPORTANCE RO 2.9 SRO 3.1

2.4 Emergency Procedures /Plan

2.4.1 **Knowledge of EOP entry conditions and immediate action steps.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.6 SRO 4.8

2.4.2 **Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.**
(CFR: 41.7 / 43.5 / 45.7 / 45.8)
Note: The issue of setpoints and automatic safety features is not specifically covered in the systems sections.
IMPORTANCE RO 4.5 SRO 4.6

2.4.3 **Ability to identify post-accident instrumentation.**
(CFR: 41.6 / 43.1 / 45.4)
IMPORTANCE RO 3.7 SRO 3.9

2.4.4 **Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.**
(CFR: 41.10 / 43.2 / 45.6)
IMPORTANCE RO 4.5 SRO 4.7

2.4.5 **Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.7 SRO 4.3

2.4.6 **Knowledge of EOP mitigation strategies.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.7 SRO 4.7

2.4.7 **Deleted**

2.4 Emergency Procedures /Plan (Continued)

2.4.8 **Knowledge of how abnormal operating procedures are used in conjunction with EOPs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.5

2.4.9 **Knowledge of low power/shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.2

2.4.10 **Deleted**

2.4.11 **Knowledge of abnormal condition procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.0 SRO 4.2

2.4.12 **Knowledge of general operating crew responsibilities during emergency operations.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.0 SRO 4.3

2.4.13 **Knowledge of crew roles and responsibilities during EOP usage.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.0 SRO 4.6

2.4.14 **Knowledge of general guidelines for EOP usage.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.5

2.4.15 **Revised & moved to 2.1.38**

2.4 Emergency Procedures /Plan (Continued)

2.4.16 **Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, AOPs, and SAMGs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.5 SRO 4.4

2.4.17 **Knowledge of EOP terms and definitions.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.4.18 **Knowledge of the specific bases for EOPs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.3 SRO 4.0

2.4.19 **Knowledge of EOP layout, symbols, and icons.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 4.1

2.4.20 **Knowledge of the operational implications of EOP warnings, cautions, and notes.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.3

2.4.21 **Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.**
(CFR: 41.7 / 43.5 / 45.12)
IMPORTANCE RO 4.0 SRO 4.6

2.4.22 **Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.**
(CFR: 41.7 / 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.4

2.4 Emergency Procedures /Plan (Continued)

2.4.23 **Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 4.4

2.4.24 **Deleted**

2.4.25 **Knowledge of fire protection procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.3 SRO 3.7

2.4.26 **Knowledge of facility protection requirements, including fire brigade and portable fire fighting equipment usage.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.1 SRO 3.6

2.4.27 **Knowledge of "fire in the plant" procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 3.9

2.4.28 **Knowledge of procedures relating to a security event.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.2 SRO 4.1

2.4.29 **Knowledge of the emergency plan.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 3.1 SRO 4.4

2.4.30 **Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.7 SRO 4.1

2.4 Emergency Procedures /Plan (Continued)

2.4.31 **Knowledge of annunciator alarms, indications, or response procedures.**
(CFR: 41.10 / 43.5 / 45.3)
IMPORTANCE RO 4.2 SRO 4.1

2.4.32 **Knowledge of operator response to loss of all annunciators.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.6 SRO 4.0

2.4.33 **Moved to 2.2.43**

2.4.34 **Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.2 SRO 4.1

2.4.35 **Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.0

2.4.36 **Deleted**

2.4.37 **Knowledge of the lines of authority during implementation of the emergency plan.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.0 SRO 4.1

2.4.38 **Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.4 SRO 4.4

2.4 Emergency Procedures /Plan (Continued)

2.4.39 **Knowledge of the RO's responsibilities in emergency plan implementation.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 3.9 SRO 3.8

2.4.40 **Knowledge of the SRO's responsibilities in emergency plan implementation.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 2.7 SRO 4.5

2.4.41 **Knowledge of the emergency action level thresholds and classifications.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.9 SRO 4.6

2.4.42 **Knowledge of emergency response facilities.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 2.6 SRO 3.8

2.4.43 **Knowledge of emergency communications systems and techniques.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.2 SRO 3.8

2.4.44 **Knowledge of emergency plan protective action recommendations.**
(CFR: 41.10 / 41.12 / 43.5 / 45.11)
IMPORTANCE RO 2.4 SRO 4.4

2.4.45 **Ability to prioritize and interpret the significance of each annunciator or alarm.**
(CFR: 41.10 / 43.1 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.1 SRO 4.3

2.4.46 **Ability to verify that the alarms are consistent with the plant conditions.**
(CFR: 41.10 / 43.1 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.2 SRO 4.2

2.4 Emergency Procedures /Plan (Continued)

2.4.47 **Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 4.2 SRO 4.2

2.4.48 **Revised & Moved to 2.2.44**

2.4.49 **Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.**
(CFR: 41.10 / 43.2 / 45.6)
IMPORTANCE RO 4.6 SRO 4.4

2.4.50 **Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.**
(CFR: 41.10 / 43.5 / 45.3)
IMPORTANCE RO 4.2 SRO 4.0

Recommended Revision to NUREG 1123, Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors

Two new statements added for clarification

1.13.3 Technical Requirements Manual (TRM) - For the purpose of this catalog, K/A's that reference Technical Specifications may include the Technical Requirements Manual, where applicable.

1.13.4 K/A Clarifying Examples – K/A's that include the words 'such as', list suggested topical areas as examples and are not intended to be all inclusive.

2.0 GENERIC KNOWLEDGES AND ABILITIES

2.1 Conduct of Operations

2.1.1 **Knowledge of conduct of operations requirements.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.8 SRO 4.2

2.1.2 **Knowledge of operator responsibilities during all modes of plant operation.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 4.1 SRO 4.4

2.1.3 **Knowledge of shift or short-term relief turnover practices.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7 SRO 3.9

2.1.4 **Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.**
(CFR: 41.10 / 43.1 / 43.2)
IMPORTANCE RO 3.3 SRO 3.8

2.1.5 **Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 2.9 * SRO 3.9

2.1.6 **Ability to manage the control room crew during plant transients.**
(CFR: 41.10 / 43.5 / 45.12 / 45.13)
IMPORTANCE RO 3.8* SRO 4.8

2.1.7 **Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.**
(CFR: 41.5 / 43.5 / 45.12 / 45.13)
IMPORTANCE RO 4.4 SRO 4.7

2.1 Conduct of Operations (continued)

2.1.8 **Ability to coordinate personnel activities outside the control room.**
(CFR: 41.10 / 43.1 / 45.5 / 45.12 / 45.13)
IMPORTANCE RO 3.4 SRO 4.1

2.1.9 **Ability to direct personnel activities inside the control room.**
(CFR: 41.10 / 43.1 / 45.5 / 45.12 / 45.13)
IMPORTANCE RO 2.9* SRO 4.5

2.1.10 **Moved to 2.2.38**

2.1.11 **Moved to 2.2.39**

2.1.12 **Moved to 2.2.40**

2.1.13 **Knowledge of facility requirements for controlling vital/controlled access.**
(CFR: 41.10 / 43.5 / 45.9 / 45.10)
IMPORTANCE RO 2.5 SRO 3.2

2.1.14 **Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.1 SRO 3.1

2.1.15 **Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 2.7 SRO 3.4

2.1.16 **Deleted**

2.1.17 **Ability to make accurate, clear, and concise verbal reports.**
(CFR: 41.10 / 43.1 / 45.12 / 45.13)
IMPORTANCE RO 3.9 SRO 4.0

2.1 Conduct of Operations (continued)

2.1.18 **Ability to make accurate, clear, and concise logs, records, status boards, and reports.**
(CFR: 41.10 / 43.1 / 45.12 / 45.13)
IMPORTANCE RO 3.6 SRO 3.8

2.1.19 **Ability to use plant computers to evaluate system or component status.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 3.9 SRO 3.8

2.1.20 **Ability to interpret and execute procedure steps.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 4.6 SRO 4.6

2.1.21 **Ability to verify the controlled procedure copy.**
(CFR: 41.10 / 43.5 / 45.10 / 45.13)
IMPORTANCE RO 3.5* SRO 3.6*

2.1.22 **Revised & Moved to 2.2.35**

2.1.23 **Ability to perform specific system and integrated plant procedures during all modes of plant operation.**
(CFR: 41.10 / 43.5 / 45.2 / 45.6)
IMPORTANCE RO 4.3 SRO 4.4

2.1.24 **Moved to 2.2.41**

2.1.25 **Ability to interpret reference materials, such as graphs, curves, tables, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.9 SRO 4.2

2.1.26 **Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 3.4 SRO 3.6

2.1 Conduct of Operations (continued)

2.1.27 **Knowledge of system purpose and/or function.**
(CFR: 41.7 / 43.1)
IMPORTANCE RO 3.9 SRO 4.0

2.1.28 **Knowledge of the purpose and function of major system components and controls.**
(CFR: 41.7 / 43.1)
IMPORTANCE RO 4.1 SRO 4.1

2.1.29 **Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.**
(CFR: 41.10 / 43.1 / 45.1 / 45.12)
IMPORTANCE RO 4.1 SRO 4.0

2.1.30 **Ability to locate and operate components, including local controls.**
(CFR: 41.7 / 43.1 / 45.7)
IMPORTANCE RO 4.4 SRO 4.0

2.1.31 **Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.6 SRO 4.3

2.1.32 **Ability to explain and apply system limits and precautions.**
(CFR: 41.10 / 43.2 / 45.12)
IMPORTANCE RO 3.8 SRO 4.0

2.1.33 **Moved to 2.2.42**

2.1 Conduct of Operations (continued)

2.1.34 **Knowledge of primary and secondary plant chemistry limits.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 2.7 SRO 3.5

2.1.35 **Knowledge of the fuel-handling responsibilities of SROs.**
(CFR: 41.10 / 43.7)
IMPORTANCE RO 2.2 SRO 3.9

2.1.36 **Knowledge of procedures and limitations involved in core alterations.**
(CFR: 41.10 / 43.6 / 45.7)
IMPORTANCE RO 3.0 SRO 4.1

2.1.37 **Knowledge of procedures, guidelines, or limitations associated with reactivity management.**
(CFR: 41.1 / 43.6 / 45.6)
IMPORTANCE RO 4.3 SRO 4.6

2.1.38 **Knowledge of the station's requirements for verbal communications when implementing procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7* SRO 3.8

2.1.39 **Knowledge of conservative decision making practices.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.3

2.1.40 **Knowledge of refueling administrative requirements.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.8 SRO 3.9

2.1.41 **Knowledge of the refueling process.**
(CFR: 41.2 / 41.10 / 43.6 / 45.13)
IMPORTANCE RO 2.8 SRO 3.7

2.1 Conduct of Operations (continued)

2.1.42 **Knowledge of new and spent fuel movement procedures.**
(CFR: 41.10 / 43.7 / 45.13)
IMPORTANCE RO 2.5 SRO 3.4

2.1.43 **Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc.**
(CFR: 41.10 / 43.6 / 45.6)
IMPORTANCE RO 4.1 SRO 4.3

2.1.44 **Knowledge of RO duties in the control room during fuel handling such as responding to alarms from the fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.**
(CFR: 41.10 / 43.7 / 45.12)
IMPORTANCE RO 3.9 SRO 3.8

2.1.45 **Ability to identify and interpret diverse indications to validate the response of another indicator.**
(CFR: 41.7 / 43.5 / 45.4)
IMPORTANCE RO 4.3 SRO 4.3

2.2 Equipment Control

2.2.1 **Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.**
(CFR: 41.5 / 41.10 / 43.6 / 45.1)
IMPORTANCE RO 4.5 SRO 4.4

2.2.2 **Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.**
(CFR: 41.6 / 41.7 / 43.1 / 45.2)
IMPORTANCE RO 4.6 SRO 4.1

2.2.3 (multi-unit license) **Knowledge of the design, procedural, and operational differences between units.**
(CFR: 41.5 / 43.1 / 45.12)
IMPORTANCE RO 3.8 SRO 3.9

2.2.4 (multi-unit license) **Ability to explain the variations in control board layouts, systems, instrumentation and procedural actions between units at a facility.**
(CFR: 41.10 / 43.1 / 45.1 / 45.13)
IMPORTANCE RO 3.6 SRO 3.6

2.2.5 **Knowledge of the process for making design or operating changes to the facility.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.2 SRO 3.2

2.2.6 **Knowledge of the process for making changes to procedures.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.0 SRO 3.6

2.2.7 **Knowledge of the process for conducting special or infrequent tests.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.9 SRO 3.6

2.2.8 **Deleted**

2.2.9 **Deleted**

2.2 Equipment Control (continued)

2.2.10 **Deleted**

2.2.11 **Knowledge of the process for controlling temporary design changes.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 2.3 SRO 3.3

2.2.12 **Knowledge of surveillance procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.7 SRO 4.1

2.2.13 **Knowledge of tagging and clearance procedures.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 4.1. SRO 4.3

2.2.14 **Knowledge of the process for controlling equipment configuration or status.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.2.15 **Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.**
(CFR: 41.10 / 43.3 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.2.16 **Deleted**

2.2.17 **Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.8

2.2 Equipment Control (continued)

2.2.18 **Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.9

2.2.19 **Knowledge of maintenance work order requirements.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.3 SRO 3.4

2.2.20 **Knowledge of the process for managing troubleshooting activities.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 2.6 SRO 3.8

2.2.21 **Knowledge of pre- and post-maintenance operability requirements.**
(CFR: 41.10 / 43.2)
IMPORTANCE RO 2.9 SRO 4.1

2.2.22 **Knowledge of limiting conditions for operations and safety limits.**
(CFR: 41.5 / 43.2 / 45.2)
IMPORTANCE RO 4.0 SRO 4.7

2.2.23 **Ability to track Technical Specification limiting conditions for operations.**
(CFR: 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.1 SRO 4.6

2.2.24 **Ability to analyze the effect of maintenance activities on the status of limiting conditions for operations.**
(CFR: 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.0 SRO 4.2

2.2.25 **Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.**
(CFR: 41.5 / 41.7 / 43.2)
IMPORTANCE RO 3.2 SRO 4.2

2.2 Equipment Control (continued)

2.2.26 **Moved to 2.1.40**

2.2.27 **Moved to 2.1.41**

2.2.28 **Moved to 2.1.42**

2.2.29 **Moved to 2.1.35**

2.2.30 **Moved to 2.1.44**

2.2.31 **Revised & Moved to 2.1.36**

2.2.32 **Deleted**

2.2.33 **Deleted**

2.2.34 **Revised & Moved to 2.1.43**

2.2.35 **Ability to determine Technical Specification Mode of Operation.**
(CFR: 41.7 / 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.6 SRO 4.5

2.2.36 **Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.1 SRO 4.2

2.2 Equipment Control (continued)

2.2.37 **Ability to determine operability and/or availability of safety related equipment.**
(CFR: 41.7 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.6

2.2.38 **Knowledge of conditions and limitations in the facility license.**
(CFR: 41.7 / 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.6 SRO 4.5

2.2.39 **Knowledge of less than or equal to one hour Technical Specification action statements for systems.**
(CFR: 41.7 / 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.9 SRO 4.5

2.2.40 **Ability to apply Technical Specifications for a system.**
(CFR: 41.10 / 43.2 / 43.5 / 45.3)
IMPORTANCE RO 3.4 SRO 4.7

2.2.41 **Ability to obtain and interpret station electrical and mechanical drawings.**
(CFR: 41.10 / 45.12 / 43.1 / 45.13)
IMPORTANCE RO 3.5 SRO 3.9

2.2.42 **Ability to recognize system parameters that are entry-level conditions for Technical Specifications.**
(CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)
IMPORTANCE RO 3.9 SRO 4.6

2.2.43 **Knowledge of the process used to track inoperable alarms.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.0 SRO 3.3

2.2.44 **Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.**
(CFR: 41.5 / 43.5 / 45.12)
IMPORTANCE RO 4.2 SRO 4.4

2.3 Radiation Control

2.3.1 **Deleted**

2.3.2 **Deleted**

2.3.3 **Deleted**

2.3.4 **Knowledge of radiation exposure limits under normal or emergency conditions.**
(CFR: 41.12 / 43.4 / 45.10)
IMPORTANCE RO 3.2 SRO 3.7

2.3.5 **Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.**
(CFR: 41.12 / 43.4 / 45.9)
IMPORTANCE RO 2.9 SRO 2.9

2.3.6 **Ability to approve release permits.**
(CFR: 41.13 / 43.4 / 45.10)
IMPORTANCE RO 2.0 SRO 3.8

2.3.7 **Ability to comply with radiation work permit requirements during normal or abnormal conditions.**
(CFR: 41.12 / 43.5/ 45.10)
IMPORTANCE RO 3.5 SRO 3.6

2.3.8 **Deleted**

2.3.9 **Deleted**

2.3.10 **Deleted**

2.3 Radiation Control (continued)

2.3.11 **Ability to control radiation releases.**
(CFR: 41.11 / 43.4 / 45.10)
IMPORTANCE RO 3.8 SRO 4.3

2.3.12 **Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.**
(CFR: 41.12 / 43.4. / 45.9 / 45.10)
IMPORTANCE RO 3.2 SRO 3.7

2.3.13 **Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.**
(CFR: 41.12 / 43.4 / 45.9 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

2.3.14 **Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.**
(CFR: 41.12 / 43.4 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

2.3.15 **Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.**
(CFR: 41.12 / 43.4 / 45.9)
IMPORTANCE RO 2.9 SRO 3.1

2.4 Emergency Procedures /Plan

2.4.1 **Knowledge of EOP entry conditions and immediate action steps.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.6 SRO 4.8

2.4.2 **Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.**
(CFR: 41.7 / 43.5 / 45.7 / 45.8)
Note: The issue of setpoints and automatic safety features is not specifically covered in the systems sections.
IMPORTANCE RO 4.5 SRO 4.6

2.4.3 **Ability to identify post-accident instrumentation.**
(CFR: 41.6 / 43.1 / 45.4)
IMPORTANCE RO 3.7 SRO 3.9

2.4.4 **Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.**
(CFR: 41.10 / 43.2 / 45.6)
IMPORTANCE RO 4.5 SRO 4.7

2.4.5 **Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.7 SRO 4.3

2.4.6 **Knowledge of EOP mitigation strategies.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.7 SRO 4.7

2.4.7 **Deleted**

2.4 Emergency Procedures /Plan (Continued)

2.4.8 **Knowledge of how abnormal operating procedures are used in conjunction with EOPs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.5

2.4.9 **Knowledge of low power/shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.2

2.4.10 **Deleted**

2.4.11 **Knowledge of abnormal condition procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.0 SRO 4.2

2.4.12 **Knowledge of general operating crew responsibilities during emergency operations.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.0 SRO 4.3

2.4.13 **Knowledge of crew roles and responsibilities during EOP usage.**
(CFR: 41.10 / 43.1 / 45.12)
IMPORTANCE RO 4.0 SRO 4.6

2.4.14 **Knowledge of general guidelines for EOP usage.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.5

2.4.15 **Revised & moved to 2.1.38**

2.4 Emergency Procedures /Plan (Continued)

2.4.16 **Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, AOPs, and SAMGs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.5 SRO 4.4

2.4.17 **Knowledge of EOP terms and definitions.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.9 SRO 4.3

2.4.18 **Knowledge of the specific bases for EOPs.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.3 SRO 4.0

2.4.19 **Knowledge of EOP layout, symbols, and icons.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 4.1

2.4.20 **Knowledge of the operational implications of EOP warnings, cautions, and notes.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.3

2.4.21 **Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.**
(CFR: 41.7 / 43.5 / 45.12)
IMPORTANCE RO 4.0 SRO 4.6

2.4.22 **Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.**
(CFR: 41.7 / 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.6 SRO 4.4

2.4 Emergency Procedures /Plan (Continued)

2.4.23 **Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 4.4

2.4.24 **Deleted**

2.4.25 **Knowledge of fire protection procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.3 SRO 3.7

2.4.26 **Knowledge of facility protection requirements, including fire brigade and portable fire fighting equipment usage.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.1 SRO 3.6

2.4.27 **Knowledge of "fire in the plant" procedures.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 3.9

2.4.28 **Knowledge of procedures relating to a security event.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.2 SRO 4.1

2.4.29 **Knowledge of the emergency plan.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 3.1 SRO 4.4

2.4.30 **Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.7 SRO 4.1

2.4 Emergency Procedures /Plan (Continued)

2.4.31 **Knowledge of annunciator alarms, indications, or response procedures.**
(CFR: 41.10 / 43.5 / 45.3)
IMPORTANCE RO 4.2 SRO 4.1

2.4.32 **Knowledge of operator response to loss of all annunciators.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.6 SRO 4.0

2.4.33 **Moved to 2.2.43**

2.4.34 **Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 4.2 SRO 4.1

2.4.35 **Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.**
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.8 SRO 4.0

2.4.36 **Deleted**

2.4.37 **Knowledge of the lines of authority during implementation of the emergency plan.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.0 SRO 4.1

2.4.38 **Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.4 SRO 4.4

2.4 Emergency Procedures /Plan (Continued)

2.4.39 **Knowledge of the RO's responsibilities in emergency plan implementation.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 3.9 SRO 3.8

2.4.40 **Knowledge of the SRO's responsibilities in emergency plan implementation.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 2.7 SRO 4.5

2.4.41 **Knowledge of the emergency action level thresholds and classifications.**
(CFR: 41.10 / 43.5 / 45.11)
IMPORTANCE RO 2.9 SRO 4.6

2.4.42 **Knowledge of emergency response facilities.**
(CFR: 41.10 / 43.1 / 45.11)
IMPORTANCE RO 2.6 SRO 3.8

2.4.43 **Knowledge of emergency communications systems and techniques.**
(CFR: 41.10 / 43.1 / 45.13)
IMPORTANCE RO 3.2 SRO 3.8

2.4.44 **Knowledge of emergency plan protective action recommendations.**
(CFR: 41.10 / 41.12 / 43.5 / 45.11)
IMPORTANCE RO 2.4 SRO 4.4

2.4.45 **Ability to prioritize and interpret the significance of each annunciator or alarm.**
(CFR: 41.10 / 43.1 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.1 SRO 4.3

2.4.46 **Ability to verify that the alarms are consistent with the plant conditions.**
(CFR: 41.10 / 43.1 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.2 SRO 4.2

2.4 Emergency Procedures /Plan (Continued)

2.4.47 **Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 4.2 SRO 4.2

2.4.48 **Revised & Moved to 2.2.44**

2.4.49 **Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.**
(CFR: 41.10 / 43.2 / 45.6)
IMPORTANCE RO 4.6 SRO 4.4

2.4.50 **Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.**
(CFR: 41.10 / 43.5 / 45.3)
IMPORTANCE RO 4.2 SRO 4.0

ATTACHMENT 2
INITIAL SURVEY REPORT & RECOMMENDATIONS

PROJECT TO UPDATE SECTION 2, "GENERIC KNOWLEDGES AND ABILITIES," OF NUREG-1122

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ABSTRACT

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry examiner personnel have described them as the greatest source of confusion in NUREG-1122 (the Catalog) and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements. The results of the survey indicated that it would be worthwhile to update Section 2. Therefore, the WOG TWG held a workshop to review the information collected from the survey and develop recommendations for adding, deleting, and revising the K/As to increase their relevance to today's operating environment. This report summarizes the methods and findings of the survey and presents proposed revisions to the K/As in Section 2.

EXECUTIVE SUMMARY

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project (PA-OSC-139) to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) listed in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry training and examiner personnel have described them as the greatest source of confusion in NUREG-1122 and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements. The purpose of the survey was to answer the following questions: (1) do the "importance to safety" ratings for each generic K/A continue to be accurate in today's operating environment; (2) are there other generic K/As that should be added to the K/A Catalog; and (3) should the existing generic K/As continue to be used as they are currently written, clarified, or revised based on industry operating and licensing exam experience.

The survey was administered over the World Wide Web between October, 2004 and April, 2005. One hundred and twenty-nine participants completed some portion of the survey, and 118 completed the entire survey. Twenty-two of the 42 sites with operating PWRs (52%) provided respondents for the survey. The participating sites represented 15 of the 26 utilities (58%) that are currently licensed by the NRC to operate PWRs. The utility volunteers who participated in the survey (1) held a PWR license as a Reactor Operator (RO) or Senior Reactor Operator (SRO) at the time of the survey or previously held a PWR license, (2) had access to the internet, and (3) had available approximately 4 hours of time to complete the survey. Eleven NRC examiners also participated.

Only one systematic difference was found in the importance ratings provided by different groups of participants. A small, positive correlation ($r = .21$, $p < .05$) was found between the amount of time a respondent had spent standing watching over the past 5 years and the respondents' importance ratings. However, no systematic differences were found between the ratings provided by NRC examiners and utility respondents; licensed RO and SRO respondents; or training personnel, Operations management personnel, and RO or SRO job incumbents. Because the one group difference identified had a negligible impact on the ratings, group membership was not considered in the remainder of the analyses.

The average importance ratings obtained from the survey and those in the Catalog had a strong, positive relationship ($r = .91$, $p < .001$). That is, K/As that were rated as highly important in the Catalog were also rated as highly important by the survey participants, while K/As rated as low in importance in the Catalog were also rated as of low importance by the survey participants. However, the importance ratings from the survey were on average about one-half of a rating

level higher on the 1-5 rating scale used than those in the Catalog. The reasons for the higher average importance ratings in the survey could not be determined.

Additional analyses of the survey data led to the following conclusions:

- The importance ratings for 22% of the current K/As in Section 2 showed substantial variability among the raters, indicating that these K/As may require updating or clarification;
- There are many more K/As in Section 2 that are appropriate for testing in an SRO-level exam than in an RO-level exam, indicating that exam developers may have difficulties in selecting the required number of K/As from Section 2 to be tested in initial licensing exams;
- The knowledge or ability required is different for the RO and SRO jobs in 45% of the K/As, indicating that revisions to the K/As may be warranted to clarify their unique applicability to the two job levels; and
- The K/As in Subsection 2.3, Radiation Protection, appear to be particularly difficult to interpret and use as the basis for exam questions that are applicable to licensed operators' job requirements.

Based on these findings, the WOG TWG concluded that revising Section 2 would be appropriate and held a 3-day workshop to develop proposed revisions to the K/As. Workshop attendees were comprised of WOG TWG members.

The WOG TWG's recommended the following changes to Section 2 of the K/A Catalog:

- Deleting the 11 K/As that currently comprise subsection 2.3, Radiation Protection, and replacing them with 10 new K/As derived from 10 CFR 41;
- Deleting 4 additional K/As because they were determined to be adequately addressed in other K/As either in Section 2 or in other sections of the Catalog and retaining them could result in over-sampling of the topic areas;
- Revising 37 K/As to clarify their intended meaning and applicability to the RO or SRO job by making editorial changes to the wording and/or adding examples of the knowledges or abilities to which the K/As refer;
- Moving 7 K/As related to fuel handling from subsection 2.2, Equipment Control, to subsection 2.1, Conduct of Operations, for consistency with how these knowledges and abilities are discussed in NUREG-1021;
- Moving 6 K/As currently in subsection 2.1 to subsection 2.2, based on the greater relevance of their content to Equipment Control rather than Conduct of Operations;
- Moving 2 K/As from subsection 2.4, Emergency Plan/Procedures, to subsection 2.2, Equipment Control, because the knowledges or abilities apply during normal as well as abnormal and emergency operations;
- Adding one new K/A to subsection 2.1, Conduct of Operations, related to reactivity management; and

- Revising other K/As in Section 2 to correct grammatical or typographical errors, add articles of speech for clarity, and provide complete citations to the relevant paragraphs of 10 CFR 55.

If NRC approval of the proposed changes is obtained, the previous survey participants will be asked to provide importance ratings for the new and revised K/As. A revised Section 2 will then be submitted to the NRC for consideration as a replacement for the current Section 2 in the K/A Catalog.

CONTENTS

ABSTRACT ii
EXECUTIVE SUMMARY iii
CONTENTS vi

1 INTRODUCTION 1
1.1 Purpose and Scope 1
1.2 Background 1
2 METHODS 2
2.1 Respondents 2
2.2 Survey Administration 2
2.3 Survey Instrument 3
3 ANALYSIS AND RESULTS 4
3.1 Respondent Characteristics 4
3.2 Comparisons Between Respondent Groups 9
3.3 Importance to Safety Ratings 10
3.3.1 Comparison of Survey to Catalog Importance Ratings 10
3.3.2 Variability in the Importance Ratings 13
3.4 Testing the K/As on RO and SRO Licensing Examinations 16
3.5 Similarity of the Knowledge or Ability for the RO and SRO Jobs 20
3.6 Recommendations for New K/As 21
3.7 Summary of Survey Results and Conclusions 22
4 WORKSHOP METHODS AND RESULTS 22
5 STEPS TO PROJECT COMPLETION 23

ATTACHMENT 1: Instructions to Survey Participants 25
ATTACHMENT 2: Comments from Participants and History of the K/As with Standard Deviations > 1.0 28
ATTACHMENT 3: K/As that Require Different Knowledge/Ability for the SRO and RO Jobs 64
ATTACHMENT 4: Recommendations for New K/As from Survey Participants 80
ATTACHMENT 5: WOG TWG Workshop Participants 83
ATTACHMENT 6: Recommendations for Revisions to K/As 87

1 INTRODUCTION

1.1 Purpose and Scope

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project (PA-OSC-139) to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) listed in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry training and examiner personnel have described them as the greatest source of confusion in NUREG-1122 and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements. This report presents the results of the project to-date, a list of recommended changes to the K/As in Section 2, and the bases for the recommendations.

1.2 Background

NUREG-1122 (the Catalog) was initially developed in 1985 by a working group comprised of licensed Reactor Operators (ROs), Senior Reactor Operators (SROs), and NRC-certified operator licensing examiners. The original Catalog was developed using the Institute of Nuclear Power Operations' (INPO) generic Job and Task Analysis (JTA). INPO developed the generic JTA in an effort to provide a common starting point for member utilities to develop their site-specific JTAs. The NRC impaneled industry job incumbents (ROs and SROs), augmented by NRC-certified licensing examiners, to develop the current set of K/As using a consensus process and to rate the "importance to safety" of each K/A.

In 1996, the NRC updated the Catalog and made extensive changes to Section 2. These changes included: (1) moving many of the previous system generic K/As into Section 2 and revising them for plant-wide applicability; (2) reorganizing Section 2 into four subsections and establishing sampling requirements for the four subsections; (3) linking the K/As to the applicable 10 CFR 55 requirements; and (4) adding new plant-wide generic K/As. The NRC obtained new "importance to safety" ratings for the new and revised K/As, but retained the importance ratings from Rev. 0 of the Catalog for the K/As that were previously included in Section 2.

The industry has continued to accumulate operating experience and "lessons learned" over the past 20 years, as well as during the past 10 years since Rev. 2 to NUREG-1122 was published. Therefore, one purpose of this project is to update the "importance to safety" ratings in the current Catalog, as well as determine whether there are new K/As that should be added.

In addition, since the Catalog was last revised, the NRC has changed its regulations and now permits its licensees to develop operator licensing examinations, rather than restricting exam development to NRC-certified licensing examiners. In order to ensure consistency in the exam development process when implemented by the utilities, the NRC also revised NUREG-1021, *Operator Licensing Examiner Standards for Power Reactors*. The revised examiner standards decrease the latitude given to exam developers in choosing the K/As to be tested in an exam and require test items to be more closely aligned with the content of the K/As. However, it has been the experience of the WOG TWG members that some of the K/As in Section 2 are difficult to interpret, some are outdated, and some are inappropriate for licensing examinations. Therefore, it is difficult to develop written exam questions based on these K/As that are acceptable to NRC reviewers. As a result, both utility and NRC resources are wasted in the rework required to develop acceptable exams.

The WOG TWG undertook this project to answer the following questions:

1. Do the "importance to safety" ratings for each generic K/A continue to be accurate in today's operating environment?
2. Are there other generic K/As that should be added to the K/A Catalog?
3. Should the existing generic K/As be used as they are currently written, clarified, or revised based on industry operating experience?

2 METHODS

2.1 Respondents

The WOG TWG sought the largest possible participation in the survey among the utilities that are licensed to operate a PWR and sent a request for participation to each of its members, as well as to members of the Babcock and Wilcox Owners Group. The request asked for volunteers to participate in the survey who (1) currently hold or previously held a PWR license, (2) had access to the internet to complete the survey, and (3) had available approximately 4 hours of time to complete the survey. In addition, participation from NRC licensing examiners in each NRC Region was also sought.

2.2 Survey Administration

The survey was administered electronically via the World Wide Web in order to (1) permit respondents to complete the survey at their own pace, (2) reduce administration time and data input costs, and (3) maintain control over access to the survey and results.

The point-of-contact from each site that agreed to participate emailed a list of volunteer participants to the survey administrators. The administrators then contacted each volunteer and provided him or her with a unique user name and password for accessing the survey website. Only the survey administrators were able to link responses to the individual participants. Responses were collected between October, 2004, and April, 2005.

2.3 Survey Instrument

The instructions for completing the survey that were provided to the participants when they logged into the survey website can be seen in Attachment 1.

The initial survey questions requested information about each respondent, including:

- The NSSS vendor type of the PWR unit(s) for which they are licensed (or, in the case of those who are not currently licensed, the NSSS vendor types with which they are most familiar);
- Whether they were licensed at the time of completing the survey and, if so, the type of license held (i.e., RO or SRO);
- The number of years they held an RO and/or SRO license;
- Their job duties at the time of completing the survey;
- The amount of time they had spent standing watch, on shift, in the past 5 years; and
- Whether they had ever developed or reviewed an operator licensing exam.

The respondents were then asked to answer a series of questions about each of the 129 K/As in Section 2. For each K/A, respondents were asked the following questions:

- In your opinion, how important is it for ROs and SROs to master this K/A in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);
- In your opinion, which of the following exams should include questions that test for mastery of this K/A? (Response options were the site-specific RO licensing exam; site-specific SRO licensing exam; General Fundamentals Exam; Other exams such as GET or Radworker training; and don't know); and
- Is the knowledge or ability required by this K/A the same for ROs and SROs? (Response options were yes, no, and don't know).

Text fields were also provided for respondents to offer explanatory comments for their responses or additional information. The respondents also were asked for any suggestions they had for revising each K/A. At the end of the survey, the

respondents were asked to list any K/As that they believed should be added to the current K/A Catalog in Section 2 and the job position (RO, SRO, or both) to which the K/A would apply.

3 ANALYSIS AND RESULTS

3.1 Respondent Characteristics

One hundred and twenty-nine respondents answered some portion of the survey questions, and 118 completed the entire survey. Except for the data analyses that required complete data from each participant (i.e., comparisons between respondent groups), all of the responses from each participant were included in the analyses.

Twenty-two of the 42 sites with operating PWRs (52%) provided respondents for the survey. The participating sites represented 15 of the 26 utilities (58%) that are currently licensed by the NRC to operate PWRs. Eleven NRC examiners also participated. Table 1 shows the number of respondents from each site and their distribution among utilities.

Table 1: Participating Sites

Beaver Valley (FENOC)	14	McGuire (Duke)	10
Braidwood (Exelon)	4	Oconee (Duke)	6
Callaway (Ameren)	1	Palisades (NMC)	3
Catawba (Duke)	4	Palo Verde (Pinnacle)	4
Comanche Peak (TXU)	2	Prairie Island (NMC)	2
Cook (American Electric)	1	Robinson (Progress)	1
Diablo Canyon (PG&E)	8	Salem (PSEG/Exelon)	3
Farley (Southern Nuclear)	1	South Texas (STP)	17
Ginna (Constellation)	8	VC Summer (SCANA)	4
Harris (Progress Energy)	4	Vogtle (Southern Nuclear)	3
Kewaunee (NMC)	3	Wolf Creek (Wolf Creek)	14
		NRC	11

Figure 1 shows the license status of the participants at the time they responded to the survey. The majority of respondents (44%) held an active SRO license.

Thirty percent of the respondents were not licensed at the time of the survey, and 25% held an RO license.

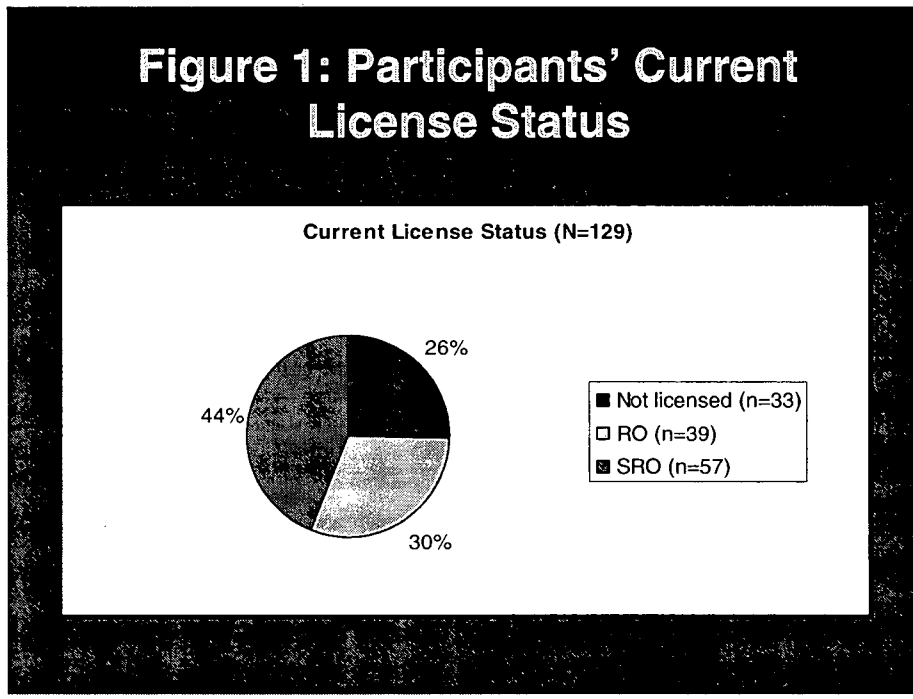
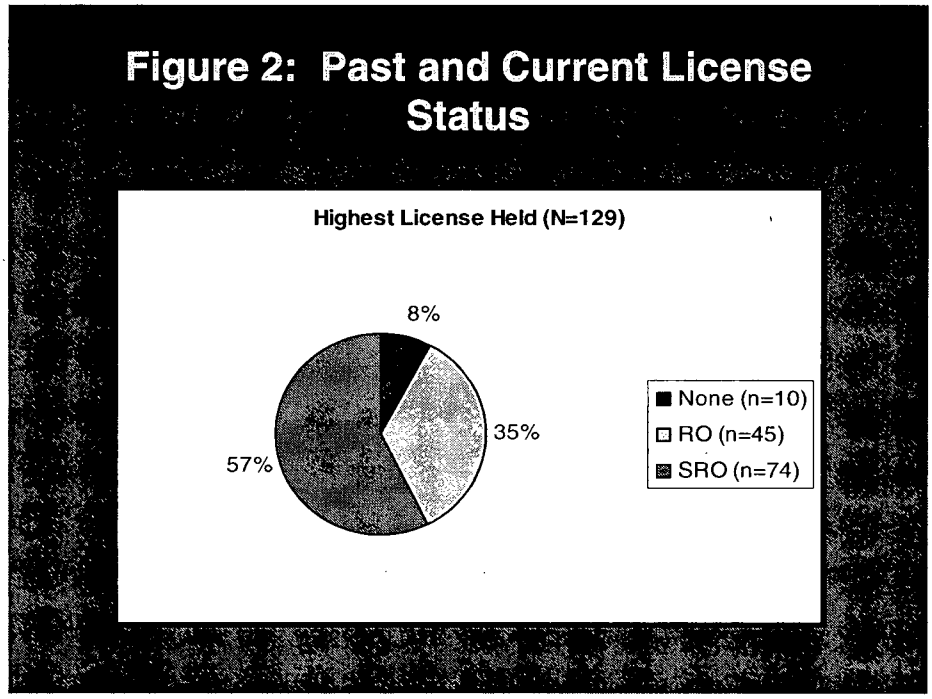
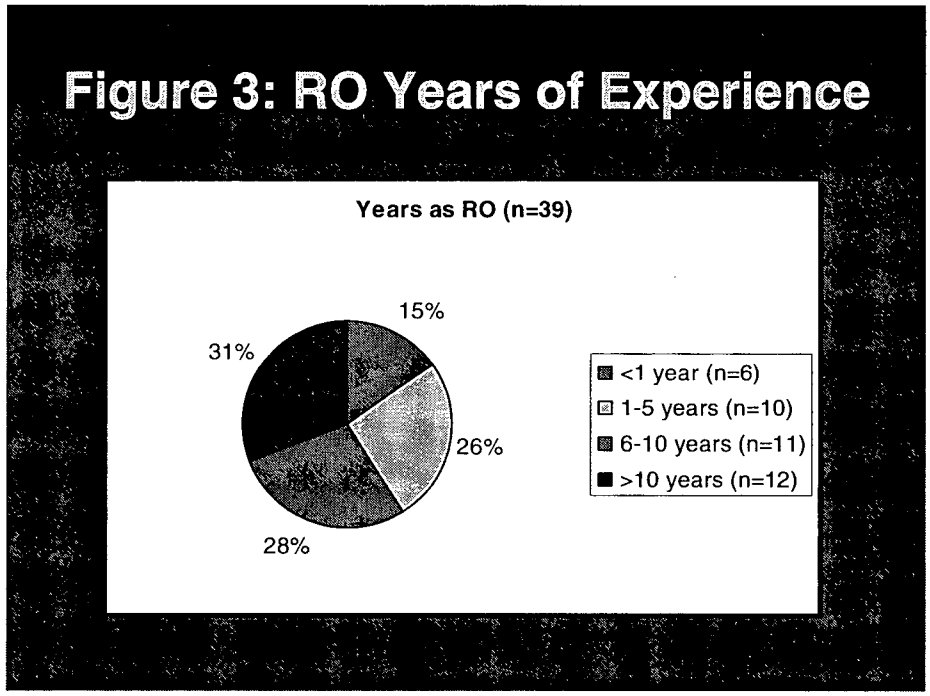


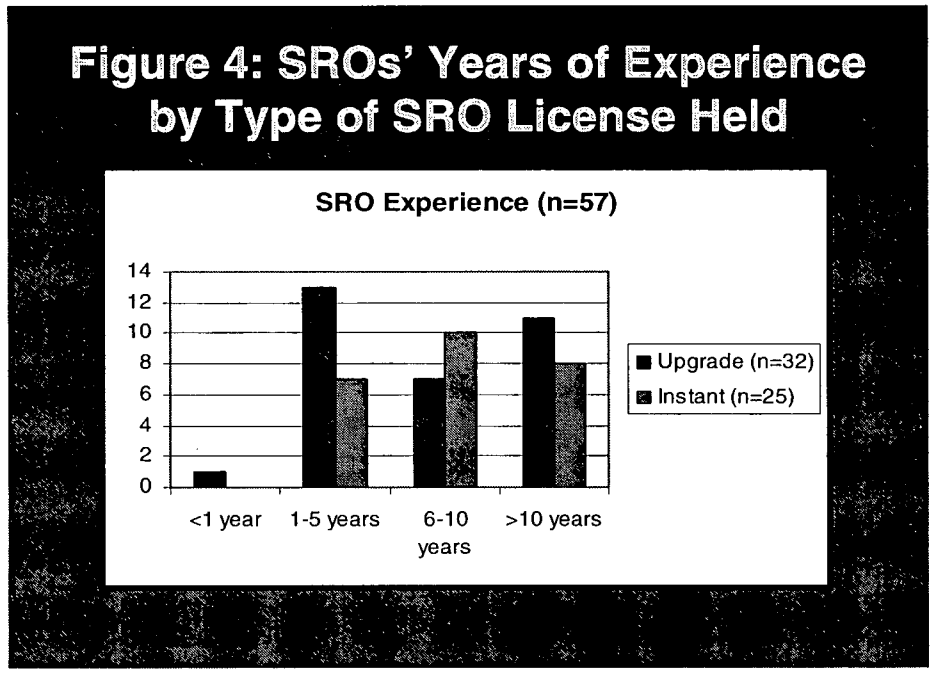
Figure 2 shows that, among the respondents who were not licensed at the time of the survey, the majority previously held an SRO license. The 10 respondents who had never held a license were NRC examiners.



In general, the respondents had many years of experience in Operations. Figure 3 shows that, among the respondents who held an RO license, the majority (59%) had been licensed for more than 5 years.



Among both the "upgrade" and "instant" SROs who were licensed at the time of the survey, the majority of had also been licensed for more than 5 years.



The majority of the respondents also indicated that they had some familiarity or experience with the exam development process. Seventy-four of the 129 respondents (57%) indicated that they had developed or reviewed a licensing exam.

Figure 5 shows the respondents' primary job duties at the time of the survey. The largest single group of respondents (30%) was involved in developing, delivering, or managing Operations training. However, when the number of control room operators, shift supervisors, unit supervisors, field operators, and the single STA was combined, the majority of the participants (58%) were currently engaged in actually performing Operations duties on shift.

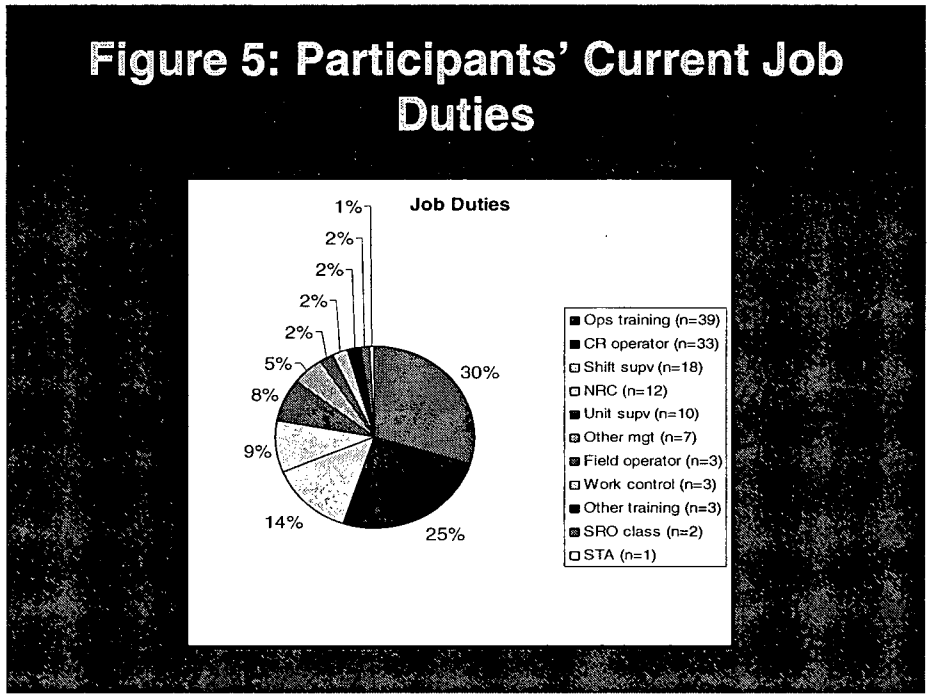
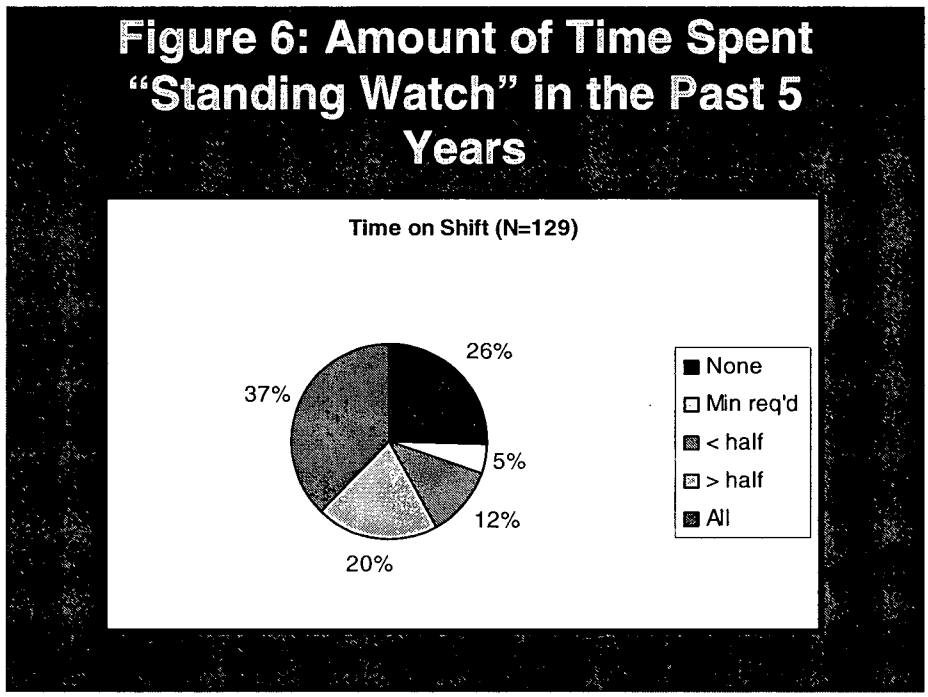


Figure 6 confirms these results by showing that 57% of the respondents had spent more than half of their time actually standing watch in the past 5 years.

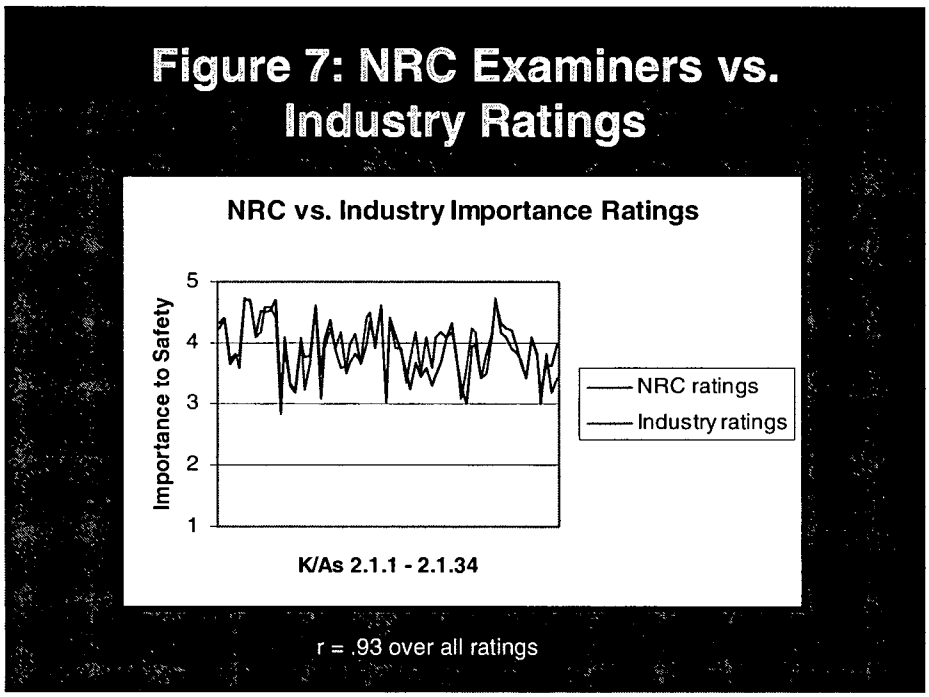


Overall, the sample of respondents appeared to represent a reasonable cross section of –

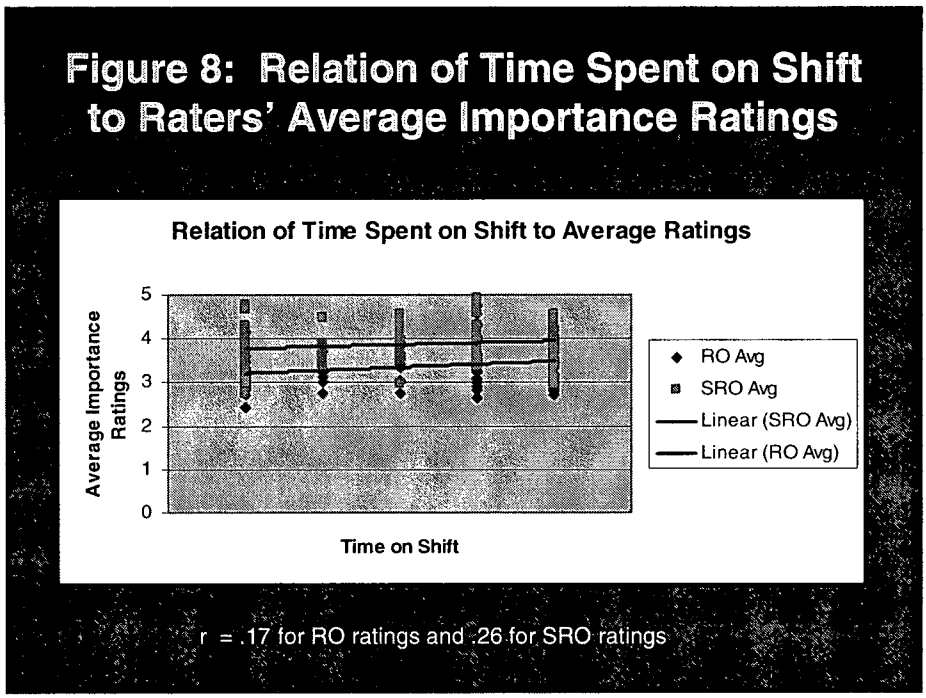
- Utilities and sites;
- Individuals who had current knowledge of PWR operations at the time of the survey; and
- Individuals who were knowledgeable of the licensing exam process.

3.2 Comparisons Between Respondent Groups

A number of analyses were conducted to determine whether there were systematic differences in the importance ratings provided by different groups of respondents. For example, the importance ratings provided by ROs were compared to those given by SROs across the set of K/As. The importance ratings provided by NRC examiners were compared to those given by industry representatives, and ratings from Operations trainers and Operations management personnel were compared to those from respondents who were currently working on-shift. In each case, no statistically significant pattern of differences in the ratings provided by the different groups was found. Figure 7 illustrates the similarity of the importance ratings provided by NRC examiners and those provided by industry personnel. The correlation of the importance ratings given by these two groups was 0.93 ($p < .001$).



Only one respondent characteristic was systematically related to the importance ratings. Overall, there was a small, positive correlation ($r = .21$, $p < .05$) between the amount of time the respondent had spent standing watch over the past 5 years and his or her importance ratings. As can be seen in Figure 8, the more time a respondent had spent on shift in the past 5 years, the higher the importance ratings



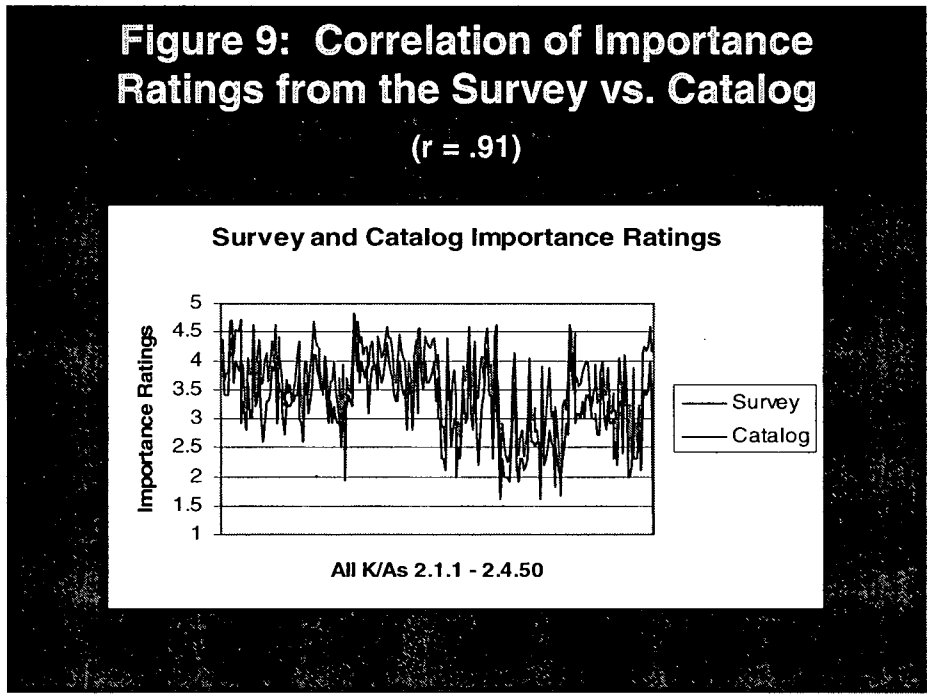
that he or she assigned to the K/As. This pattern was stronger in the importance ratings for the SRO job ($r = .26$) than for the RO job ($r = .17$). However, the relationship accounted for only about four percent of the variance in the importance ratings and so had little practical impact.

3.3 Importance to Safety Ratings

Consistent with the methods used to calculate the importance to safety ratings for Rev. 0 and Rev. 2 of NUREG-1122, the average importance rating for the RO and SRO jobs was calculated for each of the 129 K/As. The average ratings from the survey were then compared to the importance ratings documented in Rev. 2 of the Catalog.

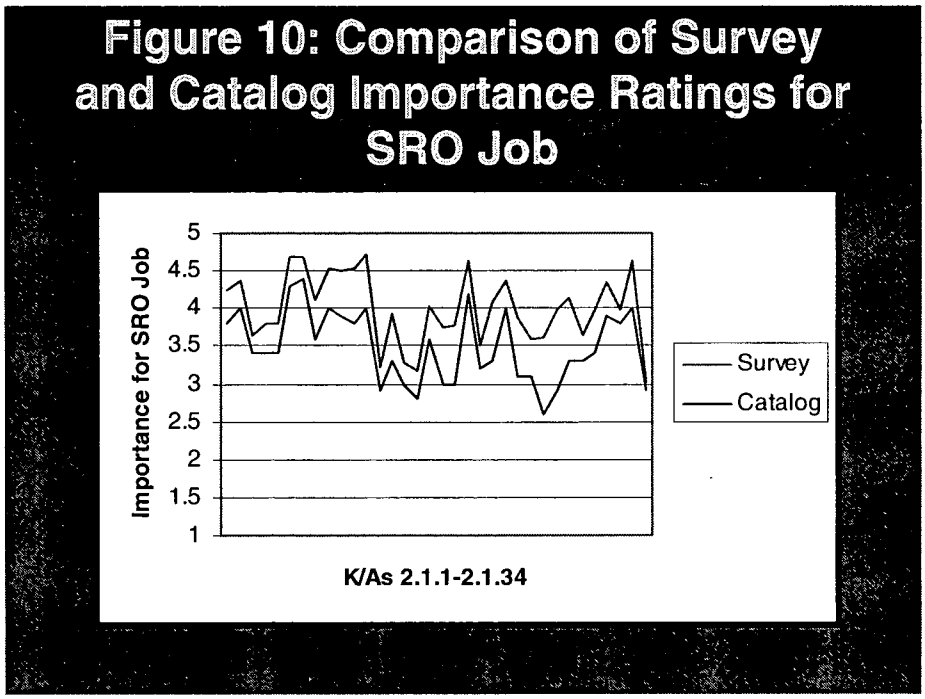
3.3.1 Comparison of Survey to Catalog Importance Ratings

Figure 9 shows that the pattern of importance ratings obtained from the survey was very similar to the pattern of ratings in Rev. 2 of the Catalog. This figure



shows the average importance rating for each of the K/As in Section 2 for the RO and SRO jobs obtained from the survey and those for each K/A for the RO and SRO jobs in the Catalog. The correlation between the importance ratings across all of the 129 K/A was $r = .91$ ($p < .001$). This strong, positive correlation means that any K/As that were previously rated as being of lesser importance in the Catalog were also rated as being of lesser importance by the survey respondents. Similarly, K/As previously rated as of higher importance in the Catalog were also rated as more important by the survey participants.

However, the survey participants gave higher importance ratings for the K/As overall than those in the current Catalog (two-tailed $t = .23$, $df = 127$, $p < .001$ for RO job; two-tailed $t = 18.86$, $df = 127$, $p < .001$ for SRO job). Figure 10 illustrates this difference by showing the importance ratings for the SRO job from the survey to the importance ratings in the Catalog for the SRO job for the 34 K/As in subsection 2.1, Conduct of Operations. Across all of the 129 K/As in Section 2, the average difference between the survey and Catalog ratings was .48. Therefore, for example, if a K/A for the RO job had an average rating of 3 (fairly important) in the Catalog, it was rated as about 3.5 by the survey participants. Analysis of the impact of this increase in the importance ratings showed that, if the ratings in the Catalog were replaced with the ratings from the survey, the ratings for 25 out of 39 K/As for the RO job that are less than 2.5 in the Catalog would exceed the current 2.5 importance rating cutoff that is used to exclude K/As from testing in an initial operator licensing examination and would be eligible for sampling. None of the importance ratings for the SRO job for any K/A that is rated as less than 2.5 in the Catalog was above 2.5 in the importance ratings from the survey.



The reasons for the higher survey importance ratings are unclear. There are several possible explanations.

One possible explanation is that the survey ratings accurately reflect the operating experience the industry has gained over the years since the K/As were last rated. Lessons learned through additional decades of operating experience may have confirmed that mastery of these K/As is more important to safe operations than was apparent to earlier raters.

Another plausible explanation is that the higher survey importance ratings are an artifact of the methods used to administer the survey. For example, the set of instructions given to the survey participants (see Attachment 1) may have differed from those given to the raters when the importance ratings in Rev. 0 and Rev. 2 of the Catalog were obtained and inadvertently influenced the survey participants' responses. A record of the instructions previously given to raters is no longer available. Alternatively, obtaining the importance ratings through a web-based survey, rather than with paper-and-pencil rating forms, may have influenced the ratings. Or, having participants rate the K/As individually rather than in a group setting may have somehow affected their ratings. However, the mechanisms by which these differences in survey methods would have led to higher ratings are unclear.

A third plausible explanation for the higher importance ratings obtained in this survey may be the characteristics of the survey participants. For example, when importance ratings were obtained for Rev. 0 and Rev. 2 of the Catalog, the groups of raters included fewer job incumbents (i.e., currently licensed ROs and SROs)

than the sample of raters who participated in this survey. In particular, this survey sample included a much smaller proportion of NRC-certified licensing examiners than the sample of raters for Rev. 2 of the Catalog. Although the ratings from the NRC-certified licensing examiners who participated in this survey did not differ from the job incumbents' ratings, the number of examiners who participated was very small ($n = 11$) and, therefore, may not have been reliable. Differences in the ratings given by examiners and job incumbents may have been found in the survey data, if the sample composition was more similar to the Rev. 2 group.

A smaller number of NRC examiners in the sample could lead to overall lower importance ratings because they are more familiar with the licensing exam process than job incumbents are likely to be. Specifically, examiners are aware of the practice that K/As that have an importance rating of less than 2.5 (which is half-way between "of limited importance" and "fairly important" on the 5-point rating scale) are generally not acceptable for testing in an exam. Most ROs and SROs on-shift would not be aware of this threshold and so might assume that a rating lower than 3 should be interpreted as indicating that the K/A is not sufficiently important to be tested on an exam. This explanation cannot be evaluated, however, because information about the actual proportions of examiners versus job incumbents in the previous groups of raters and any systematic differences in their ratings is not available.

Some slight support for this explanation was provided by the small, positive correlation between the amount of time the rater had spent on shift in the past 5 years and his or her survey importance ratings, as well as a negative correlation ($r = -.37$, $p < .05$) between the amount of time a rater had spent on shift in the past 5 years and whether the rater had ever developed or reviewed a licensing exam. That is, raters who spent more time on shift (i.e., most RO and SRO job incumbents) gave slightly higher importance ratings and were less likely to be familiar with the exam process than other groups of raters in this sample.

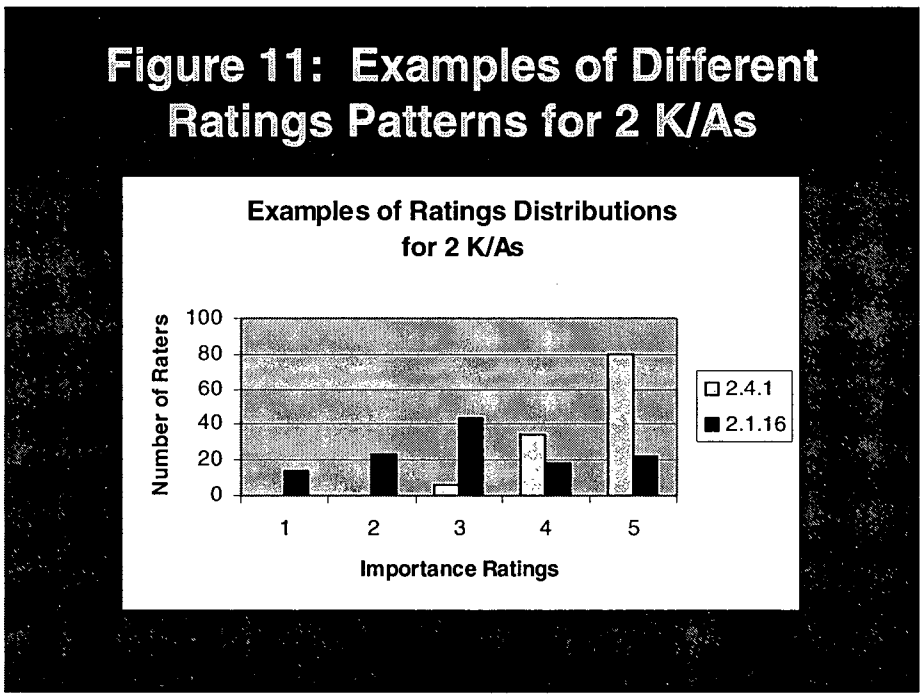
The effect of prior knowledge that an importance rating of less than 2.5 would result in the exclusion of a K/A from being tested in a licensing exam could be evaluated in another survey by providing half of the survey participants with this information, withholding it from the other half of the participants, and then comparing their ratings. Or, at the end of the survey, the respondents could be asked whether they were aware of the 2.5 threshold when they gave their importance ratings. The ratings of those who indicated they had prior knowledge of the threshold could be compared to the ratings of those who indicated they were not aware of the 2.5 threshold to identify any systematic differences in the ratings they provided.

3.3.2 Variability in the Importance Ratings

The degree of consensus among the survey participants in their importance ratings was also assessed by calculating the standard deviation (SD) of each average

importance rating for the RO and SRO jobs for each K/A. A larger SD reflects greater disagreement among the raters on the importance to safety of the K/A. An SD of 1.0 indicates that about one-third of the participants rated the K/A at least 1 rating level higher or lower than the average rating for that K/A. That is, if the average rating for a K/A was 3 (fairly important), but the ratings had an SD of 1.0, then about 15% of the participants rated it as 4 (very important) or higher in importance and about 15% rated it as 2 (of limited importance) or lower.

Figure 11 shows the distribution of the importance ratings given by the survey respondents for the K/As that had the smallest (SRO rating for K/A 2.4.1, SD = .38) and largest (SRO rating for K/A 2.1.16, SD = 1.27) SDs among all of the average importance ratings. As a general statistical rule, it would be better if the distributions of ratings for all of the K/As were similar to the distribution for K/A 2.4.1 (Knowledge of EOP entry conditions and immediate action steps), rather than to the distribution of importance ratings for K/A 2.1.16 (Ability to operate plant phone, paging system, and two-way radio). The distribution of ratings for K/A 2.1.16 would be expected from simply tossing a coin, whereas the greater agreement among the raters for K/A 2.4.1 suggests that the average importance rating better reflects its "true" importance to safety for the RO and SRO jobs.



Thirty-eight of the 258 average importance ratings from the survey (129 each for the RO and SRO jobs) had SDs greater than 1.0. The importance ratings that had higher rater disagreement were related to 28 of the K/As in Section 2 (22%). Some of the importance ratings for these K/As in the Catalog also had SDs greater than 1.0. However, the importance ratings with larger SDs were not marked in the Catalog when the new and revised K/As in Section 2 were added for Rev. 2.

Therefore, it was not possible to determine whether the importance ratings for these K/As were also problematic in the earlier surveys or problematic only for the participants in this survey.

Table 2 lists the 10 K/As for which the importance ratings had SDs greater than 1.0 for both the RO and SRO jobs. The complete list of 38 K/As for which the importance ratings showed an unacceptable degree of variability can be seen in Attachment 2. A review of the comments provided by the survey participants on the 38 K/As (also available in Attachment 2) suggested that the lack of consensus in the importance ratings resulted from three different factors.

Table 2: K/As with SDs >1.0 for both the RO and SRO Importance Ratings

Conduct of Ops
- 2.1.5
- 2.1.15
- 2.1.16
- 2.1.21

Radiation Protection
- 2.3.5

Equipment Control
- 2.2.15
- 2.2.16
- 2.2.31

Emergency Procedures/Plan
- 2.4.13
- 2.4.14

First, variability in some of the importance ratings reflected differences in the raters' operating experience at their sites. For example, many of the participants indicated that they work at single unit sites and were either guessing at the importance to safety of K/A 2.2.4 (Ability to explain the variations in control board layouts, systems, instrumentation and procedural actions between units at a facility) at a multi-license site or declined to rate it. When the importance ratings from participants at single-license sites were excluded from the averages for the K/As related to multi-license sites, the SDs of the average importance ratings decreased to less than 1.0. Similarly, the SDs of the importance ratings for some K/As related to flowchart-format emergency operating procedures (EOPs) (e.g., K/A 2.4.13, 2.4.14) were also greater than 1.0, because the large majority of PWR sites do not use flowchart-format EOPs.

Second, variability in some importance ratings reflected changes in operators' roles and responsibilities over the past two decades. For example, several of the

K/As involve activities related to initial construction and operational testing of new plants, such as K/A 2.2.16 (Knowledge of the process for making of field changes) and K/A 2.2.31 (Knowledge of procedures and limitations involved in initial core loading). Because no new plants have been constructed in the past decade, the relevance of these K/As to current operators' duties has been diminished and many of the respondents were unfamiliar with the relative importance of these activities.

Third, the respondents had difficulty in interpreting some of the K/As. For example, the respondents' comments indicated that they did not understand K/A 2.1.15 (Ability to manage short-term information such as night and standing orders). Several commented that they did not understand what was intended by the word "manage" in the K/A. Some focused on the phrase, "short-term information," and questioned the specific type of short-term information that was being referenced. When a rater interpreted "short-term information" as referring to information about temporary modifications, the commenters stated that obtaining and maintaining cognizance of such knowledge is important to safety for both ROs and SROs and gave high importance ratings. Others commented that this K/A is outdated, because reliance on night and standing "orders" has waned and the type of information that standing orders previously contained is now formalized in policies and procedures. These commenters indicated that this K/A is irrelevant now at their sites, so they rated it as "of limited importance" or "insignificant" importance.

In addition, a review of the INPO exam database showed that there appear to be fewer exam questions included in the database that test the 38 K/As that had average importance ratings with SDs greater than 1.0 in the survey than for other K/As that had average importance ratings with SDs less than 1.0. The number of questions in the exam database for each of the 38 K/As is listed in Attachment 2. For example, the exam database contains no questions that test 9 out of the 38 K/As that have importance ratings with SDs greater than 1.0. NUREG-1021 requires that the process for selecting K/As to be tested in a licensing exam must be random, but permits exam developers, with NRC approval, to eliminate some K/As that are randomly selected with an adequate justification. The small number of exam questions for these 38 K/As suggests that exam developers and NRC reviewers agree that the K/As are problematic. This result, considered together with the variability in the importance ratings and the respondents' comments, suggested that these K/As were good candidates for revision.

3.4 Testing the K/As on RO and SRO Licensing Examinations

Participants were also asked to provide their judgments of the appropriateness of testing each of the 129 K/As in Section 2 on licensing examinations. As previously discussed, the average importance ratings generally serve as the decision criterion for whether a K/A will be tested in a written exam, with a 2.5 importance rating or above as the threshold for inclusion. In addition, the average

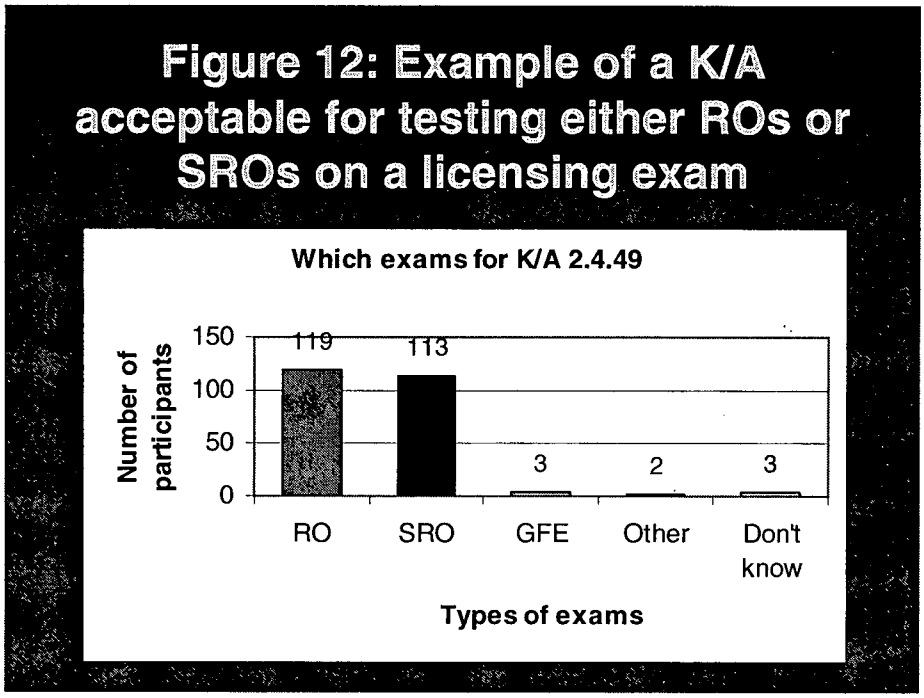
importance ratings are also used to distinguish between K/As that apply to the RO or SRO jobs. For example, if a K/A's average importance rating for the RO job is less than 2.5, but greater than 2.5 for the SRO job, the exam developer would not include a question to test that K/A on an initial operator licensing exam. A test question for that K/A could be included in the portion of an exam intended for SRO license candidates.

However, the methods used to elicit importance ratings for Rev. 0 and Rev. 2 of the Catalog, as well this survey, did not directly ask raters to judge whether each K/A was appropriate for testing on a licensing exam for ROs, SROs, both, or neither job level. Therefore, the WOG TWG added a survey question to validate these uses of the average importance ratings by soliciting the participants' judgments of which of several types of exams, to which operators are normally subject, should include questions to test each K/A. The response options for this question were:

- RO site-specific exam
- SRO site-specific exam
- General Fundamental Exam
- Other (GET, Radworker)
- Don't know

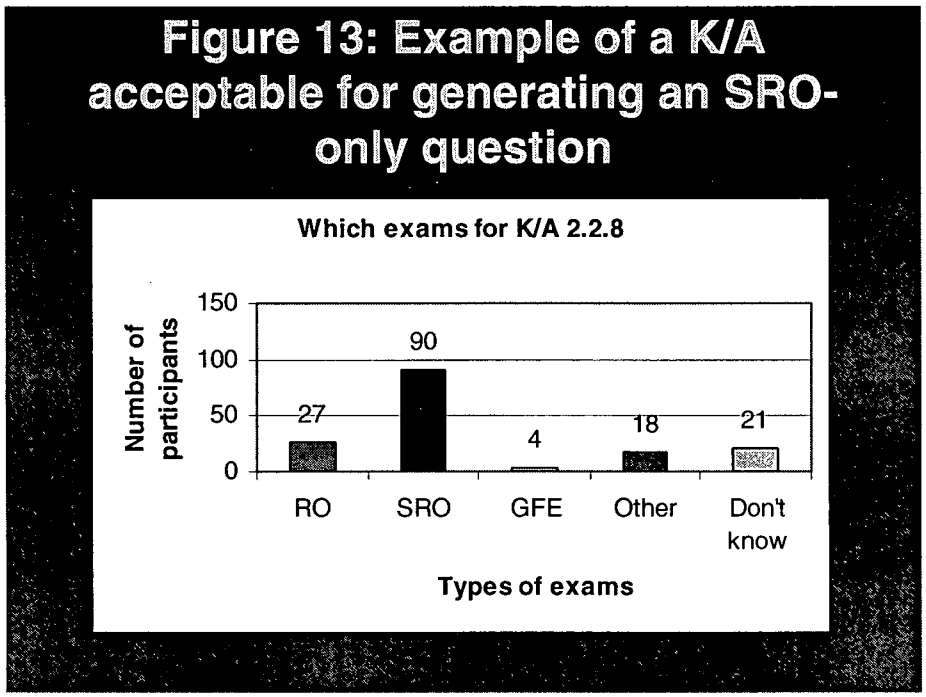
Participants were permitted to select multiple response options. The number of participants who selected each option for each K/A was then counted and compared to the total number of participants who responded to the question. If a simple majority of the respondents "voted" to include questions for a K/A on an exam, the K/A was determined to be appropriate for testing on that type of exam.

The participants' responses for about two-thirds of the K/As in Section 2 were similar to those for K/A 2.4.49 (Ability to perform without reference to procedures those actions that require immediate operation of system components and controls), as shown in Figure 12. As can be seen in Figure 12, the large majority of participants who responded to this question for K/A 2.4.49 (119/121 and 113/121) "voted" to test this K/A on both the RO and SRO site-specific exams.



However, for 42 K/As in Section 2 (about 33%), the majority of participants endorsed including questions to test the K/A on the SRO site-specific licensing exam, but not on the RO site-specific exam. For example, Figure 13 shows that, for K/A 2.2.8 (Knowledge of the process for determining if the proposed change, test, or experiment involves an unreviewed safety question), 90/121 participants "voted" to include a question to test this K/A on the SRO portion of a licensing exam, whereas only 27/121 participants endorsed including a question to test this K/A on an initial licensing exam.

By contrast, there were only 7 K/As in Section 2 for which the majority of participants endorsed including a question to test the K/A on the RO site-specific licensing exam, but not on the SRO site-specific exam.



Taken together with the average importance ratings for these K/As from both Rev. 2 of the Catalog and this survey, these results suggest that Section 2 contains a more limited set of K/As to sample for the initial licensing exam than for SRO exams. A smaller number of K/As to sample for the initial exam is problematic because most current site-specific written licensing exams are comprised of 75 questions for the RO job level and only 25 questions for SRO license candidates. To support this typical exam structure, there should be a larger number of K/As that are appropriate for testing at the RO level.

Further, the K/As that the participants did not "vote" to test on an RO site-specific exam were not evenly distributed among the subsections of Section 2. If an exam developer actually excluded these K/As when creating a sample plan for an initial licensing exam,

- 9 K/As out of the 34 in subsection 2.1, Conduct of Operations, would not be tested;
- more than half (19/34) of the K/As in subsection 2.2, Equipment Control, would be excluded;
- 7/11 K/As in subsection 2.3, Radiation Protection, would not be sampled for testing; and
- 7/50 K/As in subsection 2.4, Emergency Plan/Procedures, would not be tested on an initial licensing exam.

Therefore, identifying K/As for an RO-level exam in subsections 2.2, Equipment Control, and 2.3, Radiation Protection, may be particularly difficult for exam developers.

For 5 K/As, the majority of participants endorsed including questions to test the K/A on exams other than the RO and SRO site-specific licensing exams. These K/As, and the alternate exams endorsed by the participants, were as follows:

- 2.1.13 - Knowledge of facility requirements for controlling vital/controlled access (GET)
- 2.1.16 - Ability to operate plant phone, paging system, and two-way radio (GET)
- 2.3.2 - Knowledge of facility ALARA program (Radworker)
- 2.3.5 - Knowledge of use and function of personnel monitoring equipment (Radworker)
- 2.3.7 - Knowledge of the process for preparing a radiation work permit (Radworker)

These 5 K/As appear to be good candidates for revision to increase their applicability to licensed operator duties.

Overall, there were strong, positive correlations between the number of respondents who endorsed including questions to test a K/A on the RO and SRO site-specific licensing exams and the average importance ratings for the K/A for the RO and SRO jobs. The correlation between the number of "votes" to include a K/A on an initial licensing exam and the average importance ratings for the RO job was $r = .92$ ($p < .001$). This correlation for the SRO job was $r = .81$ ($p < .001$). These correlations suggest that the average importance ratings are consistent with participants' judgments of whether a K/A is appropriate for testing on an RO or SRO site-specific licensing exam.

3.5 Similarity of the Knowledge or Ability for the RO and SRO Jobs

The WOG TWG was also interested in the participants' judgments as to whether the knowledges or abilities required by the K/As in Section 2 are the same for the RO and SRO jobs. Ideally, if the knowledge or ability referenced in a K/A statement is different for the RO job from that required for the SRO job, there should be two different K/As to accurately capture the unique knowledges or abilities required. Currently, exam developers must rely on their personal expertise to write exam questions that are directed to the appropriate job level when a K/A is selected for testing that requires different knowledges or abilities for the RO versus SRO jobs. Revising K/As to better capture the appropriate level of knowledge could reduce the burden on exam developers as well as reduce potential confusion with respect to the link between a K/A and the questions that are developed to test it.

For each K/A, the survey respondents were asked whether the knowledge or ability described in the K/A is the same for ROs and SROs. The response options were:

- No, the knowledge or ability is different for ROs and SROs
- Yes, the knowledge or ability is the same for ROs and SROs
- Don't know

Participants were permitted to select only one response option. In addition, a text field was provided for the participants to offer any comments on how the knowledge or ability differed for the two job levels.

Results for this question indicated that the participants judged the knowledge or ability required for 58 K/As (45%) in Section 2 to be different for the RO and SRO jobs. In general, the participants' comments indicated that the SRO requires more detailed knowledge than an RO or has greater responsibility for implementing the requirements referenced in the K/As than an RO.

The 58 K/As that participants indicated require different knowledges or abilities for the RO and SRO jobs were distributed among the subsections in Section 2, as follows:

- 11/34 (32%) in subsection 2.1, Conduct of Operations
- 24/34 (71%) in subsection 2.2, Equipment Control
- 3/11 (27%) in subsection 2.3, Radiation Protection
- 20/50 (40%) in subsection 2.4, Emergency Procedures/Plan

Among this set of 58 K/As, 38 of the K/As had average importance ratings with an SD > 1.0 for either the RO or SRO job and/or the majority of participants did not endorse including questions to test the K/A on the RO site-specific exam. The remaining 20 K/As are listed in Attachment 3 with the comments provided by the respondents. Because these K/As were identified in the survey as being important to safety but as requiring different knowledges or abilities for the RO and SRO jobs, they also represented good candidates for revisions to clarify their applicability to the two job levels.

3.6 Recommendations for New K/As

The respondents provided a total of 47 recommendations for new K/As to be added to Section 2. Attachment 4 provides the complete list of recommendations. Among the 47 recommendations, the following 6 topics were mentioned by two or more respondents:

- Maintenance Rule and risk assessment
- Operations interface with the site Security Plan/Procedures
- Making operability calls
- Reportability requirements
- Severe accident management/core damage
- "Soft skills" (e.g., minimizing control room distractions, human error reduction techniques, team skills)

3.7 Summary of Survey Results and Conclusions

In summary, the results of the survey led to the following conclusions:

- The importance ratings for 22% of the current K/As in Section 2 showed substantial variability among the raters, indicating that these K/As may require updating or clarification;
- There are many more K/As in Section 2 that are appropriate for testing in an SRO-level exam than in an RO-level exam, indicating that exam developers may have difficulties in selecting the required number of K/As to be tested in initial licensing exams;
- The knowledge or ability required is different for the RO and SRO jobs in 45% of the K/As, indicating that revisions to the K/As may be warranted to clarify their unique applicability to the two job levels; and
- The K/As in Subsection 2.3, Radiation Protection, appear to be particularly difficult to interpret and use as the basis for exam questions that are applicable to licensed operators' job requirements.

The survey results and these conclusions were presented to the WOG TWG at a working session held at the Westinghouse Energy Center in Monroeville, PA, May 16-18, 2005. After review and discussion, the WOG TWG determined it would be worthwhile to propose to the NRC that Section 2 be revised to address the problems identified.

4 WORKSHOP METHODS AND RESULTS

Proposed revisions to Section 2 were developed in several steps. First, a subgroup of WOG TWG members who have been assigned to monitor the progress of this project were divided at random into two approximately equal working groups and assigned specific K/As to review from Attachments 2 and 3 to this report. Over the first 1.5 days of the workshop, the two groups reviewed the information provided and develop proposed revisions to the K/As. Additional reference materials used by the groups included Chapter 10 of the Code of Federal Regulations, Rev.s 0 and 2 of the Catalog, and Rev. 9 of NUREG-1021. An NRC representative was also present and participated as a member of one of the working groups.

On the afternoon of the second day of the workshop, the results from the two working groups were presented to all WOG TWG members who attended the meeting for additional review, revision, and concurrence. The WOG TWG members present also reviewed the survey respondents' recommendations for new K/As. Finally, the WOG TWG reviewed all of the comments provided by the survey respondents on all of the K/As to determine whether other K/As that were not listed in Attachments 2 and 3 could be improved. Attachment 5 to this

report lists the WOG TWG members who participated in the workshop and provides a brief description of each member's relevant experience.

The recommendations for revising Section 2 that were developed by the WOG TWG and the bases for the recommendations can be seen in Attachment 6. Overall, the workshop attendees recommended -

- Deleting the 11 K/As that currently comprise subsection 2.3, Radiation Protection, and replacing them with 10 new K/As derived from 10 CFR 41;
- Deleting 4 additional K/As because they were determined to be adequately addressed in other K/As either in Section 2 or in other sections of the Catalog and retaining them could result in over-sampling of the topic areas;
- Revising 37 K/As to clarify their intended meaning and applicability to the RO or SRO job by making editorial changes to the wording and/or adding examples of the knowledges or abilities to which the K/As refer;
- Moving 7 K/As related to fuel handling from subsection 2.2, Equipment Control, to subsection 2.1, Conduct of Operations, for consistency with how the knowledges and abilities are discussed in NUREG-1021;
- Moving 6 K/As currently in subsection 2.1 to subsection 2.2, based on the greater relevance of their content to Equipment Control rather than Conduct of Operations;
- Moving 2 K/As from subsection 2.4, Emergency Plan/Procedures, to subsection 2.2, Equipment Control, because the knowledges or abilities apply during normal as well as abnormal and emergency operations;
- Adding one new K/A to subsection 2.1, Conduct of Operations, related to reactivity management; and
- Revising other K/As in Section 2 to correct grammatical or typographical errors, add articles of speech for clarity, and provide complete citations to the relevant paragraphs of 10 CFR 55.

5 STEPS TO PROJECT COMPLETION

To complete the project, the WOG TWG will submit this report to the NRC for review and then meet with the NRC staff and any interested members of the public to discuss the results of the project to-date. If the NRC staff indicates that the proposed revisions to the Catalog appear to be acceptable, the WOG TWG will ask the same group of survey participants to provide importance to safety ratings for the proposed new and revised K/As. The results of this second survey will either lead to additional revisions to the proposed K/As or submittal of a revised Section 2 to the NRC for possible publication. At this time, the WOG TWG does not anticipate that the proposed revisions would require any conforming changes to NUREG-1021.

ATTACHMENTS

ATTACHMENT 1: Instructions to Survey Participants

Introduction

Welcome and thank you for agreeing to participate in this survey, sponsored by the Westinghouse Owners' Group Training Working Group (WOG TWG).

Before starting the survey, please read through this background information and the instructions. If you have questions at any time, please feel free to call either Val Barnes at 814-466-6180 or Lynn Moyer at 717-691-0369. The WOG TWG greatly appreciates your willingness to participate.

Purpose of the Project

The purpose of this project is to determine whether Section 2: "Generic Knowledges and Abilities" of NUREG-1122 (Rev. 2), Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors (i.e., the K/A Catalog), should be updated.

Background

The K/A Catalog lists the knowledge and abilities that licensed operators must have in order to operate a nuclear plant safely. It is used to develop the written portion of a site-specific operator licensing exam. Exam developers randomly sample K/As from the catalog and then write exam questions to test the candidates' understanding of the K/As that were randomly selected. In the context of a written exam, exam developers use the technical term, ***mastery*** (which you will see used in the survey), to mean that a candidate is able to correctly answer exam questions that test the candidate's understanding of a K/A.

The original K/A Catalog was developed nearly 20 years ago and re-organized and revised about 10 years ago. Since the Catalog was last revised, the industry has undergone a number of changes. These changes may have impacted the knowledge and abilities that Reactor Operators (ROs) and Senior Reactor Operators (SROs) must have to operate safely. The importance to safety of some of the K/As in the Catalog may also have changed.

Questions to be Answered

The survey you are being asked to complete will help the WOG TWG to answer the following questions:

1. How important *now* is mastery of each K/A for ROs and SROs to be able to operate safely?

2. Does each K/A statement, as it is currently written, accurately and clearly communicate the knowledge or ability that operators must have?

3. Are there additional K/As that should be included in the Catalog?

The survey will ask you questions about each of the 129 K/As in Section 2 of the Catalog, so it will take you some time to work through them all.

Organization of the Survey and Instructions

The survey starts out by asking questions about your site, the type of license you hold (if any), your operating experience, and your current job duties. You will then be asked to answer some questions about each of the K/As that are currently listed in Section 2 of the Catalog. In addition, there are text boxes provided for several of the questions in the survey, where you can type in any comments you have about the K/A or the question.

The set of questions you will be asked to answer about each K/A may change, depending on some of your answers to earlier questions. So, don't be surprised if you run into different questions for different K/As.

We expect that working through the survey will take about 4 hours of your time. If at all possible, try to avoid taking it on a dial-up internet connection. The survey file is large and takes some time to load, so it will be easier to take with a faster internet connection.

The survey is designed so that you can work through it at your own pace and on your own schedule. When you need to take a break, you don't have to logout -- just close your browser window. When you login again to work on the survey, you will need to use the links provided to you in the intial e-mail. Please note at what question you last answered, this will determine which link you use to resume taking the survey.

Please don't use the "back" or "refresh" buttons in your browser. The survey software is designed for you to use the buttons provided at the bottom of each page to navigate between questions.

Confidentiality of Your Answers

No-one within your organization will have access to the answers you provide to this survey. In fact, the members of the WOG TWG won't have access to them either, except in the aggregate. The only people who will be able to link you with your answers will be Val Barnes and Lynn Moyer from PSHA, which is the company that has been hired by the WOG TWG to conduct the survey. They need to be able to link your e-mail address with your answers so that they can contact you, if more information is needed or there has been a problem with the survey software.

A Note about Your "Importance to Safety" Ratings

For some of you, it may be tempting to pull out the current K/A Catalog and look at the existing "importance to safety" ratings for these K/As (especially now that we've brought it up). Please don't! To the extent possible, we hope that this survey will provide a "fresh" assessment of the K/As. Please base your ratings on your understanding of the RO and SRO job positions, as they exist today -- not on the ratings from 10 years ago.

Ready to begin? Click on the "Go to Next Question" button below.

Go to next question

ATTACHMENT 2: Comments from Participants and History of the K/As with Standard Deviations > 1.0

2.1.3 Knowledge of shift turnover practices.
Survey: RO Impt 3.5, SD .993 SRO Impt 3.6, SD 1.0
Catalog: RO Impt 3.0 SRO Impt 3.4
History: This K/A was added for Rev. 2.
Number of questions in INPO exam database by plant type: W 7, 1 CE, 0 B&W
Comments:

- Shift Turnover may include the watchstander-to-watchstander turnover or could be a broader topic. I suggest that it is both broader and more important for SROs. SRO = pre-turnover to post-turnover.
- Writing a good question for this topic is difficult and the topic is better suited to simulator or JPM performance.
- Use of plant equipment ID - eliminate colloquialisms and tribal data - Correlate to Operator Workarounds and deficiency tracking systems.
- In my opinion, this K/A covers "short term relief" during shift coverage. However, it could be advantageous to identify this as a separate K/A.
- Shift turnovers have been changed to include a pre-shift brief as a crew, which has improved information exchange. I suspect that the original K/A does not cover this.

2.1.5 Ability to locate and use procedures and directives related to shift staffing and activities.
Survey: RO Impt 2.85, SD 1.04 SRO Impt 3.8, SD 1.0
Catalog: RO Impt 2.3 SRO Impt 3.4
(FYI: 2.1.4 is Knowledge of shift staffing requirements)
History: 2.1.5 was A1.03 in Rev. 0, "Ability to locate and use procedures and station directives related to shift staffing and activities," with a dagger indicating the level of knowledge required by an SRO is different from the level of knowledge required by an RO.
2.1.4 was added in Rev. 2.
Number of question in INPO database: 0
Comments:

- ROs need to know this information wrt how it relates to them, while SROs need to understand it for all crew members.
- It usually falls on the shoulders of the SRO to ensure the shift is adequately staffed.
- ROs should know specific limits (OT, Medical Restrictions) from memory. SROs should be able to apply these limits.
- SROs are required to have a higher knowledge level for procedures. Especially abnormal and emergency procedures.
- RO's should be aware of their requirements, and SROs should be aware of everyone's requirements.

- "and activities" should be removed, or the "activities" should be specified. For example, if "and watchstanding practices" were used instead, then the importance level increases, and so does the RO knowledge requirement in this area.
- K/A 2.1.4 and 2.1.5 are the same thing and should be combined. In order to obtain knowledge of staffing requirements, candidates will need the ability to locate and use the appropriate procedures.
- This is redundant to 2.1.4 and is more defined. Keep this one, delete 2.1.4 - 2.1.4 is imbedded in this K/A.
- I'm making an assumption here that activities includes all C/R activities during normal and abnormal/emergency situations (you can't tell by reading it)
- Consider combining this K/A with the associated knowledge K/A number 2.1.4 into only one K/A.
- Why have a K/A on locating procedures for this particular area? The importance of locating and using procedures is more important for such things as EOPs.
- "and activities" is too subjective, or non-specific.
- "Activities" needs to be clearly defined. Shift staffing shouldn't be in this K/A.
- Should be combined with the previous k/a on staffing.
- The K/A is too vague.
- Similar in nature to 2.1.4.
- Ability to locate and use procedures should be dropped.
- Don't understand what "and activities" mean.
- This should be removed from the K/A.
- If "and activities" were to be removed, it would be fine.
- Combine with K/A 2.1.4 since it's talking about the same thing.
- Combine with K/A 2.1.4
- Specifically "and Activities".
- Ability to "locate" too simple for catalog; ability to use normal and AOPs/EOPs/alarm response should be separate
- Should be combined with K/A 2.1.4.
- It should be removed. You might as well have ability to tie your shoes. This K/A is fundamentally basic and inherently covered in many other tasks.

2.1.6 Ability to supervise and assume a management role during transients.
Survey: RO Impt 2.4, SD 1.07 SRO Impt 4.7, SD .57
Catalog: RO Impt 2.1 SRO Impt 3.4
(FYI: 2.1.7 is Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
2.1.8 is Ability to coordinate personnel activities outside the control room.)
History: Added in Rev. 2 in response to requests for K/As applicable to the operating exam.
Number of questions in INPO exam database: W 1, CE & B&W 0
Comments:
- Command and control abilities are fundamental to the job

- ROs are not required to assume management roles, while the ability to supervise is an essential skill for both ROs and SROs.
- RO's operate the unit, SRO's manage the event
- ROs could conceivably be required to fill this role during operational modes when an SRO is not required in the control room.
- RO knowledge would be of a less specific nature like the chain of command.
- ROs should be cognizant to not take on or appear to take command of the crew
- The scope of the potential roles is much larger for the SRO's where the scope for RO's is limited to Procedure Director.
- The relative positions of ROs and SROs are established. The important facet of this k/a should be what tools or avenues would a TEAM member have to refocus the team if he believed the team were about to proceed in an incorrect direction.
- Good reference is NUREG 1021 for competencies
- This is typically not an RO responsibility except in certain situations.
- This could be a description of the [XX] program. Too generic and broad to be of any use.
- This K/A includes the ability to "assume a management role" during transients and this is not a required skill for ROs. This K/A could be split into 2 separate K/As, one of which includes the ability to supervise in transients (RO and SRO applicable) and one to assume a management role (applicable to SROs only).
- As alluded to earlier, I don't see this as an independent K/A - would probably reject it as the basis for a written test question. However, it is a cross-cutting or general consideration during the operational exams.
- Applicable to the practical exam only
- This quality of a supervisor would be better observed than tested
- The problem here is that the "Ability" can't really be tested by a written test question. There is a need to have an SRO demonstrate the "ability" but in a dynamic situation (simulator) rather than test question.
- We do not test SRO's to the degree they should be tested, this is especially true for instant SRO's. An SRO should face the same exam any RO would take then given an additional exam. This exam can be tempered if the SRO is a previously RO for the plant he is being tested at, but there should not be an allowance for former SRO's from other stations or having a degree.
- Initial license candidates are made aware of their future responsibilities as license holders during their selection process short of an incapacitation event the responsibilities of each group is established by company policy.
- I noted that K/A 2.1.8 overlaps this one
- This is a KA that should be moved to a new section of the catalogue that specifically addresses the simulator exam. It would be impossible to write a question to show the ability to supervise a person.
- Focus on Roles and Responsibilities as described in plant conduct of operations and in emergency procedures.
- Ability to maintain command and control and correctly supervise and respond to plant transients and abnormal conditions
- Consider changing "upset conditions" to "emergency conditions".

- Delete this K / A.
- The verbiage of the K/A should differentiate roles and responsibilities of the RO and SRO.
- This K/A should be split into two separate requirements; ROs are not required to assume management roles.
- The role of RO does not assume any management activity and a very limited supervisory capacity.
- This is a "perform" issue. No question that you can ask on a written exam can test the "ability to supervise."
- More integrated plant knowledge should be required
- Of importance is the ROs ability to supervise field activities and the SROs ability to supervise critical (field and MCR) activities. To "assume a management role" does not add clarity and may detract from the key elements of this K/A. I would remove.
- Too wordy; "ability to supervise" and assume a mgmt role" are too close to keep both; same for "plant transients" and "upset conditions"
- delete or define "upset condition"
- Probably much less important to RO
- This should be deleted.
- Since SRO's may fill multiple emergency action roles this K/A should be divided into separate responsibilities.
- Needs to focus more in the area of overall control and command. (Keeping the big picture).
- Recommend breaking down into supervise field activities and MCR activities
- delete or define "upset condition"
- This is inherently fundamental in other tasks and the training. You will never negotiate an event and proceed through the EOPs without taking and demonstrating command and control. This does not need to be identified separately.

2.1.9 Ability to direct personnel activities inside the control room.
Survey: RO Impt 2.9, SD 1.01 SRO Impt 4.5, SD .64
Catalog: RO Impt 2.5 SRO Impt 4.0
History: Was A1.11 in Rev. 0 as "Ability to direct personnel activities inside the control room." RO impt was 2.8, SRO impt was 4.1 with an asterisk indicating variability in the ratings.
Rev. 0 also included A1.09, "Ability to coordinate personnel activities inside the control room." RO impt was 2.7, SRO impt was 3.9 with an asterisk.
(FYI: 2.1.8 is Ability to coordinate personnel activities outside the control room)
INPO exam database: W 2, CE 2, B&W 0
Comments:
- The people should be interchangeable
- Pretty much an SRO only type K/A
- SROs should be able to prioritize activities when they hit manpower limits.
- RO's do not generally direct activities inside the C/R
- ROs might direct specific tasks, SROs direct comprehensive plant operation
- Best tested on Operating Test

- In some cases, the RO's may be required to act as Procedure Director.
- ROs do not direct other ROs' actions
- K/A very similar to previous one
- very limited for ROs
- With changes in command and control lineup the RO now performs more reactivity evolutions
- Primarily SRO
- This should be included in the conduct of ops k/a
- Needs to be more job focused
- Delete this item.
- This K/A is more a performance-type ability, not a knowledge to be tested on a written exam
- Too broad and fundamental.

2.1.14 Knowledge of system status criteria which require notification of plant personnel.

Survey: RO Impt 2.9, SD 1.02 SRO Impt 3.9, SD .93

Catalog: RO Impt 2.5 SRO Impt 3.3

History: This K/A was intended to address the knowledge of when it was necessary to make a general plant page announcement for emergencies. Many plants had separate communication procedures that listed all the times (or events) that had to be announced over the plant paging system. Today, if it is important to make an announcement, there will usually be a specific step in the procedure that tells the operator to make the page announcement. The phrase, "systems status criteria," was supposed to mean plant events - from starting large pumps to reactor scrams. In the very old days, many plants did not use the plant page to announce major events and workers got contaminated or injured because they did not know that a problem had occurred. This is a lesser issue today.

This was a System Generic K/A in Rev. 0, and the importance ratings varied by system, as follows (not a complete list):

CRDS	**RO 3.2, SRO 3.9**
CVCS	**RO 2.9, SRO 3.6**
RPIS	**RO 2.5, SRO 3.3**
Continuous Rod Withdrawal	**RO 2.7, SRO 3.7**
Inoperable/Stuck Control Rod	**RO 2.8, SRO 3.4**
Reactor Trip	**RO 3.4, SRO 3.8**
Emergency Boration:	**RO 2.5, SRO 3.3**
ATWS	**RO 3.4*, SRO 4.2***
RCS	**RO 3.2, SRO 3.8**
PZR LCS	**RO 3.0, SRO 3.6**
ESFAS	**RO 3.1, SRO 3.7**
Loss of Reactor Coolant Makeup	**RO 2.5, SRO 3.4**
PZR Level Malfunction	**RO 2.6, SRO 3.3**
PZR PRS	**RO 2.9, SRO 3.6**
Pressurizer Vapor Space Accident (Relief Valve Stuck Open)	**RO 3.2, SRO 3.6**

Small Break LOCA	**RO 3.4*, SRO 4.0***
Large Break LOCA	**RO 3.4*, SRO 3.9***
PZR PCS Malfunction	**RO 2.7, SRO 3.4**
SG Tube Leak	**RO 3.1, SRO 3.9**
SGTR	**RO 3.3, SRO 4.1***

Therefore, this is not really a "plant-wide" generic, because the importance ratings changed for each system in Rev. 0.

INPO exam database: W 5, CE 1, B&W 0

Comments:

- Is this talking about the Emergency Plan and the Emergency Action Levels? That's what my answers are based on.
- Very different idea of what this K/A requires for ROs and SROs.
- I've have no idea what the focus of this item is...
- Need to clarify what this means because I don't know. I took it to mean notification of Operations Mgmt (off shift) by on-shift supervision
- "System status criteria" is vague and does not have meaning. If this is talking about the status at which we would notify the NRC or make EIP notifications then it should be in section 2.4
- Is this E-Plan?--What "personnel" are we notifying?--Plant page? , Personal notifications?, Written notifications?
- What status criteria are you talking about and notification of which plant personnel ie. plant management? or all personnel? or maintenance? or the fire brigade? etc.
- RO: when should equipment status changes be announced or communicated to NLOs. SROs: when should they report equipment issues to organizations outside of Operations or to site leadership.
- I'm not sure what this K/A is asking
- Notification of plant personal is done for almost every situation. Does not need a separate KA.
- needs work.
- SROs are more accountable for making notifications
- see previous comment
- The criticality is higher for SRO.
- SRO responsibility
- SROs have to know more of these types of criteria
- ROs - knowing when to report anomalous behavior. SROs - knowing when to mobilize support organizations.
- Mainly an SRO function.
- Notifying Supervisors is the same but notifying additional personnel is SRO responsibility.
- If this is talking about Emergency Action Levels (Alert, Unusual Event, Site Emergency, etc.) it should specify such. The way it is now, it could mean you need to know that Joe I&C tech wants to be notified whenever turbine bearing #8 vibration acts up.
- Delete this from the K/A catalog

- Not a real big deal, but should be retained since it is something SROs and crew members are responsible to maintain.
- This KA is so open to interpretation it becomes very difficult to write a question to that has meaning.
- Is this K/A aimed at PRAs? Does it imply degradation, misalignment, or inoperability? Whom is being notified, Ops management or other operators?
- Pretty straightforward, I read this as being "When do we need to tell plant personnel something has happened."
- Find out what it's suppose to mean then add some detail.
- Do not understand what the KA is looking for.
- I took this to mean notification per administrative procedure(s) for equipment/system malfunction or abnormal evolution...not notifications required by E-Plan
- Knowledge of plant status changes that...
- If the term plant personnel means on site people, this is not as important as notification of the NRC. Site personnel could mean resident inspector, ops manager, ED, General manager and in some cases could mean VPs. Also this could mean to notify work control, dispatcher, maintenance, HP, chm, etc. This would then not be as important.
- This K/A is too "wordy". Change to "notification of plant management for abnormal situations"
- I am not real sure of what the required knowledge is for this.

2.1.15 Ability to manage short-term information such as night and standing orders.
Survey: RO Impt 2.7, SD 1.01 SRO Impt 3.3, 1.01
Catalog: RO Impt 2.3 SRO Impt 3.0
History: Added in Rev 2, supposedly based on 10 CFR 45.12, and Rev. 7 of NUREG-1021, ES-301 (and it's still there in Rev. 9). However, 45.12 says, "Demonstrate the knowledge and ability as appropriate to the assigned position to assume the responsibilities associated with the safe operation of the facility," so the link isn't obvious.
INPO exam database: 0
Comments:

- Standing orders are NOT short term information at [my plant]
- Operators must be able to manage all information short or long.
- I recommend adding the word "orders" after the word "night," so that it reads, "Ability to manage short-term information such as night orders and standing orders."
- what does "manage" mean in this situation
- This information is covered in our conduct of operations manual the K/A for conduct of ops should cover this.
- Do you want to be able to test what night orders have been written? Seems too broad to me.
- Change the wording to include current industry verbiage on night and standing orders. I do not think these terms are all that common any more.
- both groups should recognize temporary conditions and act appropriately.

- This is not a licensing/training issue. This is an administrative process that is plant dependant. If a person can handle the other things necessary to get a license and has problem with this objective it is probably a plant process issue that affects all operators.
- Although I don't agree with the use of these documents to operate the plant (they don't get the level of review our procedures do), their extensive use requires frequent review and memorization. Memorization is important because (typically) there is nothing to drive us to these documents (i.e., alarm response or other procedures don't direct you to these documents for guidance).
- Delete this from the K/A catalog
- Lots of information in these documents that crew members are required to know.
- This should not be part of the NRC licensing process. It is part of the Licensee's employment practice.
- No value for this KA.
- This is more a "watch-standing skill" than an item that can be tested on a written exam since by the K/A itself, it is short-term information, and would or could change by the time the exam is administered.
- Get rid of it.
- Delete this ka. It is not necessary
- What does it mean? What are night orders or standing orders?
- Having the knowledge of these items is important, but I'm not even sure what the ability to "manage" these items refers to.
- This K/A could test "Rules of Practice". These are general rules for how we operate.
- This KA has an ability which is hard to test on a written exam. So this should be a simulator ability. Night orders and standing orders are no different than any other procedure and are usually implemented with a TCN or other plant change process. This has a very low priority in today's world.
- This administrative issue may deal with safety or non-safety related instructions dealing with temporary issues in the plant. The issue involved should be examined for specific systems involved. The administrative handling of the night or standing order has no bearing on safe plant operation. Review and understanding of these documents would be a part of the watch turnover process.
- My problem is testing students on Night orders that are not important.

2.1.16 Ability to operate plant phone, paging system, and two-way radio.
Survey: RO Impt 3.2, SD 1.31 SRO Impt 3.2, SD 1.27
Catalog: RO Impt 2.9 SRO Impt 2.8
History: Was A1.04 in Rev. 0, RO impt was 3.0, SRO impt was 3.2
INPO exam database: 0
Comments:

- This is a communication standard K/A, as such it should state the expected standard
- there are skills every operator must have, but there are very few rules associated with this topic.
- Remove from K/A catalog.
- K/A needs to be deleted entirely

- Re-write as "Knowledge and/or ability of the procedural requirements for operating plant (cell) phones, paging systems, and two-way radios."
- How do you test ability to answer phone
- Delete this item.
- Should be dropped
- this is general knowledge
- delete too simple
- SRO has to know how to communicate for emergency actions otherwise too generic.
- probably belongs with conduct of ops k/a
- Remove from K/A catalog.
- this ability is demonstrated in performance of task which are covered by other K/A's
- N/A - See additional comments to preceding question.
- needs current technology added
- This is too fundamental and shouldn't be a K / A.
- The communications system is simple enough to operate
- Basic Knowledge
- Remove from K/A catalog.
- Best tested on Operating Test
- The SRO has a higher importance for EPlan
- Delete this K/A
- Revise to ability operate electronic media
- Knowledge is required by both, especially during fires, black-out coping or other emergencies.
- In Today's society I would expect everyone to know how to use phones, pagers, radios, etc. This does not need to be a K/A.
- Delete this from the K/A catalog
- This K/A does not do anything for the operators. If it were changed to state something to the effect of adverse or emergency conditions (i.e how to contact individuals when the normal communication systems are down). Then each station could ask specific questions on their emergency or alternate communication systems. But the way it is now every body can answer a phone.
- Skill of the craft. Not really a discriminating K/A. Basic knowledge.
- For safe operation of the plant this is a very narrow scope, could be eliminated as written without impact on ability to safely operate the unit.
- Should be broken out to emphasize mastery of communication systems relied on for shutdown outside the control room.
- Should be deleted. Adds no value.
- Remove from K/A Catalog.
- Remove this item.
- I don't think this has any safety significance to plant operations
- I do not think this should be a test item.
- fairly important, but not difficult enough to keep in catalog.
- This KA does not test a skill that a licensed individual can necessarily demonstrate unless on a inplant walkthrough or a simulator exam. This is a skill of the craft issue.

- Should drop this item from k/a. It has no relevance to operating license.
- Its important to communicate, but use of phone, PA, radio are also fairly basic skills. Use as an evaluation topic on simulator, but doesn't belong on exam.
- delete, doesn't affect safety
- K/A s should be of higher importance than something so mundane as using a radio or page. Take this one out.
- This KA is a skill of the craft KA and shouldn't be on a licensing exam. Everyone in the plant needs this skill. It is not discriminatory for a licensed operator. the KA should be deleted.
- While it is important to be able to operate phone, pager, etc. I'm not sure how you test this, except in the simulator
- Ability to operate plant phones, paging systems, plant computer systems, radio system and any other means of vital communications.
- Delete this K/A. This is tested during simulator portion of the exam.
- Delete this item.
- This K/A should be a Job Performance Measure (JPM) Evaluated in the Simulator or Plant
- Ability to operate plant communications systems.

2.1.21 Ability to obtain and verify controlled procedure copy.
Survey: RO Impt 3.5, SD 1.06 SRO Impt 3.5, SD 1.07
Catalog: RO Impt 3.1 SRO Impt 3.2
History: Was A1.01 in Rev. 0, RO impt 3.3, SRO impt 3.4. Despite the improvements in methods for controlling procedure copies, there continued to be a fairly significant number of LERs and inspection reports recorded in the NRC's Human Factors Information System documenting occasions on which an outdated version of a procedure was used (more than 150/year), right up until 1998 when the ROP was initiated and reporting of these kinds of incidents ended.
Exam bank questions address which procedure copies (which locations) can be used without verifying the rev in the computer system, how often the proc rev must be verified on a job that extends over several days, and procedure use requirements – whether it must be in-hand, reviewed beforehand, etc. (which isn't really relevant to this K/A).
(FYI 2.1.20 is Ability to execute procedure steps.)
INPO exam database: W 2, CE 0, B&W 1
Comments:
- Electronic media has rendered most of this moot. With the ability to poll a database for the latest revision eliminates the need to process controlled documents
- Remove from K/A catalog.
- Re-write as "Knowledge and/or ability necessary for obtaining and verifying the correct controlled procedure."
- This ability should have been CLEARLY demonstrated long before a person is ever selected for license class
- Remove from K/A catalog.

- Combine with others, this seems like a real waste of knowledge item. Makes me want to say. Duh...
- N/A - See additional comments to preceding question.
- administrative requirement
- This K/A is meaningless since licensed operators work in an environment where procedures are automatically controlled.
- should be dropped
- This task is so simple that if you cannot perform this you shouldn't even be taking this exam.
- This is enforced in OJT.
- I like specific K/A's, such as this.
- Delete this from the K/A catalog
- this is a basic k/a and the plant site should have trained this k/a in very early in someone's career.
- Eliminate the requirement since it is out-dated.
- No value in this KA.
- This is a General Nuclear Procedure at our site and this knowledge is required for all employees not just operators. Probably could be removed from K/A catalog.
- this is easy and should only be covered on sim or in plant
- This should be an admin task placed in 1021, ES-301B.1.
- This type of question should not be on any type of license exam. This is a basic fundamental question and should have been developed for the non-licensed individual.
- Getting the right procedure rev. is important, but given the maturity of procedures, accidentally getting a previous revision is probably not a significant safety challenge.
- This is usually OJT type training/evaluation.
- Delete this K/A
- I'm not sure about other sites' exams, but this was tested during the in-plant portion of our licensing exam. I think this is a waste of the NRC examiner's time since this is a requirement for all personnel on-site.
- Combine with k/a just prior to this one on the survey
- Delete K/A. Even though it is an important skill for operators to have, there is virtually no discriminatory value when applied to exams, unless examiners start placing old revisions of procedures in the simulator and then set the applicants up to take the wrong course of action when they use the wrong revision - which is not going to happen.
- Delete this K A.
- This is important, but should be re-enforced in OJT.

2.1.22 Ability to determine Mode of Operation.
Survey: RO Impt 3.75, SD 1.02 SRO Impt 4.1, SD .97
Catalog: RO Impt 2.8 SRO Impt 4.2
History: Not in Rev. 0, added for Rev 2, supposedly based on 43.5, which states, "Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations," and 44.13, which states,

"Demonstrate the applicant's ability to function within the control room team as appropriate to the assigned position, in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments are not violated."
The exam questions in the INPO database focus on establishing a set of conditions with distractors and ask the candidate to determine which mode the plant is in.
INPO exam database: W 4, CE 2, B&W 1
Comments:

- MODES are defined in the Technical Specifications with specific data points. Requiring a person to recognize the definition of MODE is of little value.
- Ability to determine 1 from 2 seems irrelevant. Operators must recognize requirements change as modes change. Making the distinction between a few degrees of temp, a few psi in RCS press or 1% reactor power is meaningless by itself.
- This K/A is not a test of knowledge as written. The ability to understand plant conditions should be tested, Mode is only temperature.
- I'm not sure what they are telling me I have to know.
- Re-write as "Knowledge and/or ability necessary for determining the plant's Operational Mode."
- Not descriptive enough to ensure consistent application
- Not worth testing on, if you don't know what mode you're in, you might think about resigning your license...
- Can the Operator correctly apply Tech Specs given different plant modes?
- N/A - See additional comments provided for preceding question.
- Not sure what you're looking for, can SRO tell what Mode the plant is in. or are you looking for Mode of Operation of different equipment?
- Should be dropped
- There's no value added for teaching what is defined by procedure and Technical Specification. Prohibitions contained in plant procedures coupled with current training makes this K/A too narrowly focused to provide a challenging question.
- Change to read, "Ability to determine the plant mode of operation based on the definitions in Tech Specs"
- Wouldn't it be more appropriate to say, "Ability to interpret plant conditions for MODES of operation?"
- This KA has limited value. Not sure how to fix.
- This could also be written as a knowledge statement.
- Rewrite K/A to be a little clearer on the required ability.

2.1.29 Knowledge of how to conduct and verify valve lineups.
Survey: RO Impt 3.7, SD 1.01 SRO Impt 3.6, SD .91
Catalog: RO Impt 3.4 SRO Impt 3.3
History: Was K1.01 in Rev 0, RO impt 3.6, SRO impt 3.7
INPO exam database: W 3, CE 1, B&W 2
Comments:

- This is normally an AO function
- This is a skill that is required of a non-licensed person.

- Rewrite as "Knowledge and/or ability necessary to properly conduct and/or verify valve, breaker, and switch lineups."
- This is an integral part of system knowledge.
- Delete K/A. This is a job requirement of non licensed operators.
- N/A - See additional comments provided for preceding question.
- At this site RO and SRO do not perform valve lineups
- This is a skill that is required of a non-licensed person.
- Basic NLO competency.
- Delete K/A
- Hard to evaluate in test environment, leave to site qual card
- GET or Basic Operator
- This is a performance type item. Not test questions needed. Evaluated on QCC and JPMs and simulator.
- Delete this from the K/A catalog
- Should include concepts of independent verification, concurrent verification and when each applies.
- this is another candidate for separating written from admin task.
- This is a skill that is required of a non-licensed person.
- This is a fundamental task for the non-licensed operator. An ro in the control room verifies valve lineups differently than in the field. This k/a should fall into the systems portion of testing.
- Knowledge of correct performance and verification of valve lineups.

2.1.34 Ability to maintain primary and secondary plant chemistry within allowable limits.
Survey: RO Impt 2.6, SD .94 SRO Impt 3.0, SD 1.02
Catalog: RO Impt 2.3 SRO Impt 2.9
History: Was A1.14 in Rev. 0, RO impt 2.5*, SRO impt 2.9
INPO exam database: W 2, CE & B&W 0
Comments:

- Operators do not control or maintain chemistry control parameters. An understanding of chemistry control is required but the procedures that control chemistry are essentially not operations controlled.
- Operators don't "maintain" chemistry parameters
- The operator does not have a direct impact for maintaining these parameters. They can respond and address but not directly alter these items.
- Operators at my plant do not maintain chemistry limits. We respond to Chemistry dept requests and information provided.
- Remove from K/A catalog.
- Chemistry department samples and advise the CR staff of chemistry concerns. There are no meters we use to adjust primary chemistry with or determine what changes are needed. License operators should understand the reason for control chemistry and the
- As written, this is a Chemistry Dept function. Recommend "comply with ... plant chemistry limitations"

- Re-write as "Knowledge and/or ability necessary to ensure 'out-of-specification' plant chemistry limits are identified by shift operators for action as appropriate by plant chemistry."
- Operators don't really maintain chemistry. Should limit this to "knowledge of chemistry limits"
- This more for Chemistry. We respond to chemistry dept.
- Remove from K/A catalog.
- Actions required to maintain proper Chemistry are recommended by the Chemistry dept. following samples.
- Operators rely on the chemistry dept to alert us to chemistry parameters and provide us with advice on corrective measures. The tech spec relationship is the operators responsibility.
- This is more administrative than specific. I would not expect the operators to have all the limits memorized, but they should know where they are located, how to reference them, when to notify Chemistry, etc.
- Chemistry Dept. tells us what's required to maintain limits. All we do is operate the systems (demins, add chemicals, etc.) based on their requirements.
- Ability to recognize proper response to chemistry control abnormalities.
- Delete this from the K/A catalog. This is really a function of Chemistry as an Ops Support Group. They monitor the plant chemistry and perform or recommend changes based on their monitoring.
- Adding chemicals is the limit of ability. Sampling, analysis, and adjustments are all made outside OPERATIONS, therefore has little impact on the ability of the operator to safely operate the plant. Knowledge of chemistry conditions and effects on corrosion, reactivity, and radiological controls is about the total extent of knowledges required.
- Operators should understand how different configurations affect chemistry. In my experience, however, the Chemistry department drives chemistry issues at a mature plant. The Operators respond accordingly without sacrificing the primacy of their role.
- Only understanding of tech spec related chemistry parameters and actions should be addressed.
- Delete the K & A, since other than operate the plant, ROs and SROs do no activities to maintain chemistry on their own. When directed by chemistry, we have the NLO place a demin in service or flush chemicals to the system, but we do not add chemicals ourselves, nor do we sample the system
- Practical exam only
- Primary/Secondary Chemistry is maintained by the direction of chemistry, we need to know and recognize limits in our procedures and tech specs and operate the plant per our procedures.
- Tough one, Operations does not normally maintain Chemistry limits, simply implements actions based on a Chemistry Instruction. Is it like this for other plants?
- Remove from K/A catalog; Chemistry personnel action, they communicate with operators.

- Change to: Understand the reason why and how chemistry is controlled both primary and secondary.
- The K/A should drop the secondary plant reference. Also, the chemistry limits should be tied to those addressed in Tech Specs.
- I think this is something to be aware of and know that operations may have to respond to a problem, but I do not think this needs to be tested.
- While an RO or SRO interfaces with this ability in some ways (and the SRO is responsible for overall control), this is a chemistry dept function/ability, and the operators mostly manage and must understand the limits.
- This K/A should be eliminated. We have a whole department that is responsible for plant chemistry.
- This KA is no longer performed by the operating crew but is monitored and driven by the chemistry group. This should be removed from the KA catalogue.
- ro/sro's operate the plant. we have chemistry personnel that monitor the chemistry of the systems. This is not an area that should be on ro/sro license exam. This should have been covered in GFE.
- Chemistry makes recommendations for operation to maintain operation within limits. Operators should be aware of the limits but not actions to maintain limits.
- This KA should be revised due to actions by the operator are directed by Chemistry procedure.
- chemistry control is within the chemistry department. Operations makes chem adds after a request from Chemistry.
- Test on Simulator or on a JPM
- This function is provided by our Chemistry personnel. They inform us of chemistry results and whether or not they meet certain 'Action Levels'. We then maneuver the plant if necessary but we, as Operators, don't "maintain chemistry within limits".
- As RO/SRO's, we rely on Chemistry to monitor and make recommendations for chemistry control. We do require a knowledge of chemistry limits, and knowledge of how to change given parameters.
- SRO must know the limits and the general action to restore
- Chemistry control comes from proper system operation. The limits are monitored by chemistry. System Function K/A's should cover this item.

2.2.3 Knowledge of the design, procedural, & operational differences between units.
Survey: RO Impt 3.7, SD 1.01 SRO Impt 3.8, SD .98
Catalog: RO Impt 3.1 SRO Impt 3.3
History: Added in Rev. 2
INPO exam database: W 2, CE & B&W 0
Comments:

- I think the K/A is different depending on whether the Applicant is dual licensed or not.
- If operators work all units, then it is important--if they are limited to a single unit but work at a multiunit facility it may be unimportant.--If a knowledge deficiency exists then it will be addressed by appropriate KAs specific to a given Unit
- We have sister plants

- For Applicants at a site like Millstone (one Westinghouse and one Combustion Engineering unit), this K/A is of limited import. However, for a site like Salem, the K/A is important because the SRO, as Shift Manager, may be providing oversight to either unit. I don't know how I would evaluate a site like Indian Point (two units of the same NSSS) but divergent operating history.
- N/A, we're a single unit plant
- Pretty clear!
- we are single unit
- single unit site
- Delete it because an RO or SRO always operates a specific unit, even at a multi unit site so any knowledge deficiency will always be specific to a particular unit, which will be covered by an appropriate KA. In other words, there is no knowledge or ability that this KA uniquely covers.
- the generic side of this needs to be deleted and the systems side retained.
- This KA should apply to plants with dual unit licenses, but not multi-unit plants with separate RO/SRO licenses for each unit.
- I operate at a single unit utility
- (multi-unit) Knowledge of unit differences including design, procedural, and operational differences.
- Our site has unit specific licenses and exams. I don't have familiarity with dual unt licensing.
- I'm at a single unit facility and don't want to dilute multi-unit answers.
- Eliminate
- This is absolutely essential for anyone with a multi unit license.
- single unit plant

2.2.4 Ability to explain variations in control board layouts, systems, instrument and procedural actions between units at a facility.
Survey: RO Impt 3.5, SD 1.05 SRO Impt 3.5, SD .94
Catalog: RO Impt 2.8 SRO Impt 3.0*
History: Added in Rev. 2
INPO exam database: W 2, CE & B&W 0
Comments:

- This covers procedure differences that are covered in KA 2.2.3. Delete from here.
- combine with previous k/a
- needs to be divided up into two or 3 parts
- it is important to understand the differences between 2 units if they exist. The problem is this could become too large a focus on a minor, non-impacting difference.
- Consider combining this K/A with K/A 2.2.3.
- This K/A is encompassed by K/A 2.2.3.
- delete - not needed because of 2.2.3
- At [my site] the units are sufficiently different so to restrict cross unit work. The two reactors are listed as 2 single unit sites.
- More specific than 2.2.3. I believe this meets the intent of 2.2.3, and therefore 2.2.3 could probably be deleted.

- Combine with other K/A's
- I have no multi-unit experience and do not hold firm opinions on this K/A
- The ability to determine control board layout variations should be removed from the K/A. This ability should be separate and not tested in a written exam.
- Pretty clear, again.
- single unit
- too similar to 2.2.3; don't keep both
- This KA should apply to plants with dual unit licenses, but not multi-unit plants with separate RO/SRO licenses for each unit.
- I operate at a single unit utility
- combine with previous k/a
- Not familiar with dual unit licensing.
- I'm at a single unit facility and don't want to dilute multi-unit answers.
- mine is a single unit plant. N/A
- Combine with K/A 2.2.3.
- Eliminate
- single unit

2.2.5 Knowledge of the process for making changes in the facility as described in the FSAR.
Survey: RO Impt 2.2, SD .79 SRO Impt 3.2, SD 1.03
Catalog: RO Impt 1.6 SRO Impt 3.3
History: Added in Rev. 2
INPO exam database: W 1, CE & B&W 0
Comments:

- No rewrite, just delete
- It appears this K & A would not apply at all to ROs and SROs
- Design changes are processed by Maintenance & Engineering. SRO input is limited and RO input is non-existent
- Operators do not not perform this task.
- We have many process for making changes at the plant which are broad and complicated. This K/A should either be more specific or dropped.
- This should be CFR 50.59 specific
- Delete this K & A, as operators do not make changes to plant, engineers do
- Rewrite to address only those parts that shift SROs are required to deal with
- Operators do not not perform this task.
- More SRO knowledge only
- Best tested on Operating Test
- Importance too low for inclusion in license exam
- No Exams
- Not overly important for operators.
- has nothing to do plant operations, maybe I should have said delete this k/a.
- Of no value to the operation of the plant.

- This is an obscure task, that most Operators do not get involved in. These changes are typically done by engineering with little operator involvement.
- Does not affect health and safety of the public. This is one avenue that operations used to have an active part in, especially in the early 60's and 70's when operators had engineering degrees. Today these are separate groups. Delete this K/A.
- I would delete this K & A
- RO level license has almost nothing to do with this K/A.
- Cleary a SRO knowledge item, straightforward.
- Needs to be more specific to what changes it refers to etc.
- IF must be retained limit the KA to dealing with the issues where control room SROs get involved only. Administrative issues associated with design changes are functions of Engineering & Maintenance personnel
- It is very difficult to create a valid exam question on this K/A.
- This KA should be taught and included prior to an SRO taking shift, but in the initial licensing process it does not seem necessary.
- Our facility modifications are handled by Engineering. Operators support testing of mod's that require testing but rarely, if ever, drive the mod's.
- Do not include this area.
- Knowledge should be targeted toward Operations oversight, post-mod testing, and document update requirements.
- Not sure that this is a needed knowledge since the procedures should take care of this requirement. The SRO should know a little more about the process than the RO but the need for this to included in the K/A catalog is questionable.
- We have trained "specialist" to do changes. Operators need to be aware of the requirements but they don't necessarily need the knowledge of the entire process.

2.2.7 Knowledge of the process for conducting tests or experiments not in FSAR.
Survey: RO Impt 2.5, SD .91 SRO Impt 3.4, SD 1.07
Catalog: RO 2.0 SRO 3.2
History: Added in Rev. 2, supposedly based on 43.3, which reads, "Facility licensee procedures required to obtain authority for design and operating changes in the facility," and 45.13, which reads, "Demonstrate the applicant's ability to function within the control room team as appropriate to the assigned position, in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments are not violated." And 10 CFR 50.59.
INPO exam database: 0
Comments:
- Operators do not perform this task.
- Not so much too broad, ill-defined may be better description.
- Best tested on Operating Test
- no exam questions
- delete - not necessary to obtain/maintain an nrc license
- 50.59 training and exams associated with performance of infrequent activities.
- Best tested on Operating Test
- Operators do not not perform this task.

- Site specific admin procedures exam.
- The term "experiments" should be removed from the statement. Experiment implies that you don't have expected results, or you're not really sure what's going to happen. It's not the best term to use in this industry lately.
- Delete this from the K/A catalog
- this is a worthless k/a
- If any special test is required by the station, massive meetings and pre-job briefs will occur prior to the test. There is no need to test or train someone on this topic.
- This KA should be deleted. This is outside the scope of RO and SROs.
- This is another useless K & A, delete it
- SRO exam only.
- This is outside the bounds for the Ro/Sro to be tested in my opinion.
- experiments is a bad word, we do not conduct experiments in our power plants. Every evolution is performed using an approved procedure for a specific purpose.
- Delete. Not done
- Operators do not perform this task.
- Any tests or experiments not described in the FSAR would be well researched, approved, practiced on the simulator, and reviewed by engineering and plant management prior to an operator doing anything.
- Test and procedures outside the scope of the safety analysis report I feel should not be performed.
- We have trained "specialists" to do changes. Operators need to be aware of the requirements but they don't necessarily need the knowledge of the entire process.

2.2.8 Knowledge of the process for determining if change/test/experiment involves a USQ.
Survey: RO Impt 2.4, SD .86 SRO Impt 3.6, SD 1.01
Catalog: RO 1.8 SRO 3.3
History: Added in Rev. 2, supposedly based on 43.3, 45.13, and 50.59.
INPO exam database: W 3, CE & B&W 0
Comments:

- K/A should be deleted
- Remove from K/A catalog.
- [My utility] no longer uses the term "unreviewed safety question". This process is evaluated through the 10CFR50.59 process and would result in a license amendment if needed.
- delete, this is engineering function
- Operators do not not perform this task.
- K/A Should be deleted
- Remove from K/A catalog.
- Make into a SRO only K/A
- with the exception of unreviewed safety question.
- delete K/A not a CRO function

- This K/A, as written, bypasses the established processes at our site. Affected departments, not just Operations, would have a cut at this and any activity should go through multiple layers of approval before reaching the Operating crew.
- Remove from K/A catalog.
- Best tested on Operating Test
- Qualified Safety Reviewer exam; not a function of licensed RO or SRO
- no exam questions
- Operators do not not perform this task.
- 10CFR 50.59 training
- Limited applicability for operators.
- This is 50.59 space and must be limited to the screening, which requires qualification. Most candidates are NOT qualified
- 50.59 and procedures admin training.
- 50.59 training.
- Again, please remove "experiment."
- Delete this from the K/A catalog
- this is a little more important than several of the previous k/a's
- Tests or experiments that involve an unreviewed safety question are discussed with engineering and plant management prior to implementation and can't be trained or tested, since this is something that may never occur.
- Should be deleted. Don't do these type of test.
- Remove from K/A catalog; this item should be part of each plant's administrative requirements AND should be performed/completed by other than operators.
- Suggest replacing unreviewed safety question with license amendment
- This is outside the bounds for ro.sro knowledge
- First, the term unreviewed safety question is no longer in 10CFR50.59, and should be re-written. Also, this is a separate qualification at most plants and therefore should not be part of the operator KA catalog.
- Need to narrow the focus into what a RO would realistically deal with compared to the expectations for a SRO relating to this item.
- USQs are dealt with in design of the plant and subsequent changes by Engineering Support staff who do not require a license. Delete as K/A
- Operators do not not perform this task.
- This is another KA that should be included in an SRO training program prior to taking shift, however, not in the initial licensing program.
- Delete - Already covered under other K/As.
- This is Licensing issue and does not fall with the scope of the operator. The process has changed significantly enough from its inception to be of no value within the context of operations.
- This K/A should be very generic in a license class setting.
- We have trained "specialists" to do changes. Operators need to be aware of the requirements but they don't necessarily need the knowledge of the entire process.

2.2.9 Knowledge of process to determine if a change/test/experiment increases the probability or consequences of an accident.

Survey: RO Impt 2.2, SD .81 SRO Impt 3.3, SD 1.11
Catalog: RO 2.0 SRO 3.3
History: Added in Rev. 2 from same bases as 2.2.7 and 2.2.8
INPO exam database: 0
Comments:

- See K/A 2.2.8; remove this one also.
- Operators do NOT do probabilistic risk assessment to calculate the chance of accidents
- A bit wordy.
- delete KA
- Operators do not not perform this task.
- INPO SOER 91-01 mandated new requirements that make this K/A moot.
- Too many K/A's about the 50.59 process
- Don't think that is the operators job.
- This K/A is a little vague. Please reword.
- The concept is about right, just too many words to convey the meaning.
- Remove
- Best tested on Operating Test
- Qualified Safety Reviewer; same comments as for previous K/A
- none, this is not SRO/RO job
- 10CFR50.59 training
- Tests over the Administrative process for performing these evolutions has its own rules and requirements separate from plant response to actions taken
- delete - not necessary to obtain/maintain an nrc license
- 50.59 training
- Please remove "experiment."
- this is pra stuff and should be thought about by sros
- We do not do these types of activities.
- This K/A does not apply to ROs/SROs
- The process does not help us run the plant if this stays in rewrite to focus on just determining the impact.
- Should be reworded to include keywords such as PRA, risk assessment etc.
- redundant to 2.2.8, and part of a separate qualification, not part of operator training.
- This is performed by Engineering Support staff. Not control room licensed personnel. A license is not required.
- Operators do not not perform this task.
- This is another KA that needs to be taught after the initial licensing process.
- This K/A needs to be rewritten to reflect the current industry practices. As written, it could be interpreted to mean performing Risk Assessments from memory. It's hard enough to use the computer to run the codes.
- We have trained "specialists" to do changes. Operators need to be aware of the requirements but they don't necessarily need the knowledge of the entire process.

2.2.10 Knowledge for determining if the margin of safety, as defined in T.S., is reduced by a proposed change/test/experiment.

Survey: RO 2.4, SD .83 **SRO 3.5, SD 1.08**
Catalog: RO 1.9 **SRO 3.3**
History: Same as above.
INPO exam database: W 2, CE & B&W 0
Comments:

- need to get rid of work experiment
- Remove; similar comment to previous two K/A items.
- Operators do not do this, nor have input to it
- Risk Assessment?
- delete KA
- Operators do not not perform this task.
- This is at the Engineering level, NOT OPERATIONAL
- The facets of 10CFR50.59 do not seem to be stressed as much today. Much of this is left to Licensing or Engineering. This is a mistake in my opinion.
- ROs and SROs have no need for this operation
- Traditionally an SRO function.
- More for SROs
- Qualified Safety Reviewer; same comments as for previous 2 K/As
- no exams
- 10CFR50.59 training
- Do not include this item on written exams.
- delete - not necessary to obtain/maintain an nrc license
- should not be on licensing exam
- 50.59 training
- Please remove term "experiment."
- Delete this from the K/A catalog
- poorly written k/a, it's gibberish
- 2.2.6-2.2.10 Are typical processes that occur outside of normal operation and are typically more the arena of engineering analysis and use of a Qualified Reviewer in Operations, which require additional training beyond the scope of a standard operators license. These and similar K/A should be combined.
- Remove from K/A catalog.
- Delete this K/A
- The process does not help us run the plant if this stays in rewrite to focus on just determining the impact.
- Could be combined with 2.2.9
- Once again, this is part of 10CFR50.59 training (separate qualification at most facilities), and should not be in the KA catalog.
- This is performed by Engineering Support Staff who don't hold licenses. RO & SRO have no need to deal with this on shift. If not determined before it comes to the control room, it needs to be sent back for resolution
- Operators do not not perform this task.
- K/A is too wordy and complicated
- Delete - already covered under other K/As.

- This is too nebulous and fuzzy to accurately reflect what is important. If this is to be retained, then the actual ability should be well defined. As is, it's saying you need to know how to fill out a form.
- Not so much the process, but recognizing when the margin of safety is impacted is what should be considered here.
- This is a 50.59 training program issue. I am not sure it belongs in a LOT class environment issue.
- We have trained "specialist" to do changes. Operators need to be aware of the requirements but they don't necessarily need the knowledge of the entire process.

2.2.15 Ability to identify and utilize as-built design and configuration change documentation to ascertain expected current plant configuration and operate the plant.
Survey: RO 2.8, SD 1.05 SRO 3.3, SD 1.03
Catalog: RO 2.2 SRO 2.9
History: Added in Rev. 2, supposedly based on 43.3, and 45.13.
INPO exam database: 0
Comments:

- Don't know what this K/A is talking about.
- Should be deleted
- This K/A is far too verbose.
- This makes no sense to me
- Seems redundant to previous K/As.
- too broad
- Not sure what you want them to be able to do
- This K/A should be removed form the catalog entirely or moved to a startup section for new plants.
- Needs some specifics
- Shorten to identify and utilize as built. second ka for config change docs
- Confusing
- none needed. we don't read AS BUILTs that I've ever seen.
- If it's asking "Ability to identify and utilize plant drawings, logics, and schematics to ascertain expected plant configuration and operate the plant," then that's what it should say. Otherwise, I'm not really quite sure what documentation it's referring to.
- Delete this from the K/A catalog
- admin at best, worthless k/a
- It is not clear as to what this K/A is trying to describe.
- I suspect that this K/A had greater importance before current standards for procedure use and adherence were in vogue. Licensed operators really don't need to interpret design and modification documentation to OPERATE. However, they should be able to understand such documentation because they are called on to support design and implementation of modifications.
- Simplify the wording. Use two sentences if necessary, or split it into multiple K/As.
- I would revise the K/A to "Ability to read and interpret design and configuration change documentation

- Remove from data base.
- Wording is terrible. Ability to determine any current off-normal plant configuration and its impact on operating the plant.
- Someone is going to have to help me with this one...
- knowledge of implemented design changes would be a reasonable KA, but the above KA is too broad in scope and is not easily understood.
- KA needs rewriting to define what is wanted here.
- In the operations arena we do not worry about the as built design and configuration as we are about the current procedure. If there is a discrepancy between the as built and the current config. then the procedure group and plant staff would handle that issue.
- KA too broad and ambiguous. Should not be tested as operators use licensing basis documents and configuration control to ensure plant configuration.
- This is the worst K/A wording I have seen. SIMPLIFY!!! What is the K/A trying to say?
- combine with similar k/a's
- Could be combined with another K/A.
- This sounds like plant engineering to me.
- Not sure what you want them to do.

2.2.16 Knowledge of the process for making of field changes.
Survey: RO 2.4, SD 1.01 SRO 3, SD 1.12
Catalog: RO 1.9 SRO 2.6*
History: Added in Rev. 2, supposedly based on 41.10 and 45.13. 41.10 reads, "Administrative, normal, abnormal, and emergency operating procedures for the facility."
The term "field changes" is derived from basic engineering terminology used during the construction days of the plants. System design drawings were produced back at an AE office as master drawings. Blueprints of these drawings were sent to the site from which the plant was build. When the blueprints arrived in the "field," the construction people discovered they could not build the system to the match the drawing - for many reasons. So they authorized "field changes" - changes made in the field. They of course had to determine that the field change did not adversely affect the design attributes of the system. The process of changing the design drawings to reflect the field changes was referred to as creating the "as built" drawings. The marked up blueprints were returned to the AE and the master drawings were updated with the changes. New blueprints were made and issued.

If the change was an actual design modification caused by a corrective action or the installation of new equipment, it was not called a field change.

Each plant construction office had a set of "master blueprints" - drawings that had all field changes marked on them in "pen and ink". But they did not update ALL the drawings on the site this way. They kept the master set updated and made notations on the copies that a "field change" was installed. This notation required the operator to stop and get a copy of the master blueprint (with actual pen and ink

changes) before proceeding to work on the system. The field changes were also sent back to the AE office and the engineers would then incorporate the field changes and completely redraw the master drawing.

With the advent of CAD and the maturity of the plants, the need to be able to work with drawings that are not 100% up to date is far less frequent than it used to be. But it is still important IF the utility makes a permanent change to a system that causes the system to deviate from the design that is contained in the controlled drawings. If the drawings are not maintained 100% up to date, they should have a way to flag changes made in the field to the operator. Most plants now require all controlled drawings to be maintained 100% up to date through admin controls.
INPO exam database: 0
Comments:

- field changes have nothing to with ops.
- What is this - is this the same as a temporary Mod?
- what field changes are they referring to
- What is a field change?
- Remove-an Engineering function.
- This K/A is obsolete, procedure compliance requires activities to be proceduralized
- Clarify field changes! To me this means to a procedure but may mean to the plant (as in temporary mod)
- very unclear. I would have a hard time writing a question to cover this
- This K/A does not apply to our plant.
- What is a field change--plant equipment?, procedure? both?
- I am not clear on the difference between this K/A and K/A 2.2.14.
- The KA needs to specify if it relates to procedure changes or temporary modifications or valve lineup changes. This probably should be 3 separate KAs.
- Not clear as to the meaning.
- Could be better written.
- need to better define "field changes"
- Field changes to what? Procedures? Equipment?
- Not an operator concern. Not something that an operator would be involved in. At my plant field changes are modifications to a design as it is being installed that have to be reviewed before the operators would be involved.
- This K/A does not apply to our plant.
- Not sure what area this K/A refers too.
- This is an awareness item
- Delete this from the K/A catalog
- throw this one out...
- Need to clearly define what a "field change" is. My understanding is that a field change is something a System Engineer might do in the process of implementing a modification.
- Remove the second "of" so that the K/A reads: "Knowledge of the process for making field changes."
- Remove from data base.

- K/A should be more descriptive. What kind of field changes? To equipment? To configuration? To operating parameters?
- My problem with this is terminology - does anyone still use "field changes". Do we mean plant modifications?
- Needs to be more specific to what changes are being referred too
- Field changes are possibly obsolete, changes would have to be evaluated to be considered safe and effective. this K/A should be deleted or the attributes should be moved to a more current K/A which is applicable.
- If this field change is part of the temporary or plant modification process (as I would expect under the equipment control section), I would assign a low importance for licensed operators. I see this as a Plant Engr function.
- operators don't need to know this "process", as it is not done by operations.
- What's a field change?
- This K/A does not apply to our plant.
- We do not do filed changes, period. If a procedure is incorrect, it is brought back and revised. If plant equipment needs to be changed, there are other ways to deal with this. This is not something we do.
- The KA needs to specify if it relates to procedure changes or temporary modifications or valve lineup changes. This probably should be 3 separate KAs.
- Need to delete this one, ops would not be making field changes at my station.
- I presume this concerns limited-scope design mods.
- Knowledge of the process for making procedure revisions.
- Rewrite as "Knowledge of the process for documenting field changes."

2.2.31 Knowledge of procedures and limitations involved in initial core loading.
Survey: RO Impt 2.5, SD 1.08 SRO Impt 3.2, SD 1.21
Catalog: RO 2.2 SRO 2.9*
History: Added in Rev 2, based on 43.6, which states, "Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity."
The exam questions in the INPO database only address refueling.
INPO exam database: W 3, CE & B&W 0
Comments:

- Get rid of the word "initial" since this implies the very first core load/cycle for the plant and all plant are older.
- The only time this would be an applicable question for an operating exam is for a new plant
- Initial core load would only occur once in the life of the plant. core reload during refueling would be a better description

2.2.33 Knowledge of control rod programming.
Survey: RO Impt 3.5, SD 1.08 SRO Impt 3.6, SD .996
Catalog: RO 2.5 SRO 2.9
History: Same as 2.2.31

INPO exam database: W 5, CE & B&W 0
Comments:

- I have no idea what this k/a is talking about
- Should be written like this: Knowledge of rod control and its operation.
- I think you mean overlap requirements.
- What does this mean? Is it intended toward bank overlap, or the signals the system compares, or how and which computers do what functions, etc.?
- Sequence, overlap, reactivity, tilt, AFD, take your pick
- rewrite this one
- this area is better tested in systems or A/EPE.
- Not entirely certain I understand how this applies to Westinghouse because I'm a B&W guy.
- This K/A is extremely vague. Are the operators expected to know how many rods are in each group, when and how fast each group moves, and the inputs to the rod control system? Or, are the operators expected to know the effects produced by control rod programming? These effects include differential and integral rod worths as a function of overlapping, axial flux distribution, and hot channel factors. If the K/A is aimed at the rod control system, then write the K/A to address the rod control system. If the K/A is aimed at the effects produced by various rod programming schemes, then write the K/A to address these effects.
- We don't have any programming for our rods but we do have control rod insertion limits. I answered as if this would be covered by this K/A, if it is then maybe this k/a should be rewritten.
- This seems more system based. Why is this in the generic section?
- I'm not sure what this K/A is looking for, needs to be more specific or maybe just clearer to what is meant by it.
- Get rid of it.
- Recognize problems associated with rod programming
- At our plant control rod programming is limited to ensuring overlap.
- This KA is not applicable.
- This K/A is too broad because on the surface it may appear that Operators should have intricate technician level knowledge of each resistor (etc.) in Rod Control. We have Maintenance organizations that we rely upon to fix these components if they malfunction. What is essential is that the Operator be able to communicate to Maintenance the symptoms of the malfunctions and be able to understand expected response of Rod Control during different transients.
- We don't use rod programming.

2.3.5 Knowledge of use and function of personnel monitoring equipment.
Survey: RO Impt 2.9, SD 1.06 SRO Impt 2.9, SD 1.02
Catalog: RO 2.3 SRO 2.5
History: Added in Rev 2, based on 41.11, which states, "Purpose and operation of radiation monitoring systems, including alarms and survey equipment," and 45.9, which states, "Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized, and ability to perform other

procedures to reduce excessive levels of radiation and to guard against personnel exposure," and NUREG-1021, ES-301, which mentions this topic.
INPO exam database: 0
Comments:

- It is not clear to me what "personnel monitoring equipment" is. The term is too vague.
- Remove from K/A catalog
- no, a GET topic
- Wearing EADs is a far cry from swinging a meter, what are we talking here?
- What are we monitoring?
- Remove
- Get rid of it.
- Specify what equipment the Operator should be familiar with. This may be site specific.
- The initial licensing process does not need to include all monitoring equipment. In fact, HP is in charge of and uses this equipment and OPS does not have a need to know how to use this equipment.
- Remove
- GET
- GET issue if at all
- Remove from K/A catalog; GET/Rad. Worker training tests this.
- GET, Radiation Worker
- Other - Better tested on operating test.
- GET 2-Radiation Worker Training
- get
- Delete this from the K/A catalog. It is redundant to other standards that require plant personnel to know these limits.
- Make the term "personnel monitoring equipment" more specific.
- This is a function for all nuclear plant employees using general access training and should not be put on a license exam.
- this is a GET topic and does not need to be on the exam
- Remove from K/A catalog; GET/Rad. Worker training (for access) covers this.
- This should be question in system to ensure understanding of where problems may occur and why, looking at things like recirculation mode.
- Operators do not use personnel monitoring equipment. Radiation Protection personnel provide coverage for personnel monitoring. Those personnel are available around the clock.
- Can't identify what a license holder needs to know that others (beyond HP) don't
- GET topic; drop from catalog
- This is of limited importance since we don't self monitor.
- Delete K/A
- GET
- This really is GET knowledge, there is no special monitoring equipment that we expose operators to in the licensing process. These lend themselves to silly JPMs.
- This is covered in general employee training.

2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.
Survey: RO Impt 3.2, SD .99 **SRO Impt 3.4, SD 1.01**
Catalog: RO 2.9 **SRO 3.3**
History: Added in Rev 2, based on 43.4, which states, "Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions, and 45.10, "Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized, and ability to perform other procedures to reduce excessive levels of radiation and to guard against personnel exposure."
INPO exam database: W 10, CE 3, B&W 0
Comments:

- NOT a very clear K/A; except for EOPs (and certain AOPs) this is done by multiple departments.
- When I read this, I think about hot spot flushes. Not sure if that's what others mean.
- Not clear what type of operating procedures would be involved; better to specify; sounds more like HP task from generic perspective
- Hot Spot flushing?
- Define what's meant, is this doing flushes or hanging lead blankets?
- Remove.
- Not clear what type of operating procedures would be involved; better to specify; sounds more like HP task from generic perspective
- Remove
- Remove
- Other -> K/A may be better tested on operating test.
- JPM
- The KA needs to be better explained. Very broad.
- This K/A is too verbose. I would change it to read: Ability to perform procedures to reduce radiation levels and minimize personnel exposure.
- Remove from K/A catalog.
- This K/A seems to apply more to Radiation Protection personnel than Operations. Unless you are talking about procedures that flush piping to lower the dose levels or performing the crud burst procedure.
- This should be a GET item.
- These procedures are not performed by Operations. These procedures are performed by Radiation Protection personnel.
- Clarify it. Are we talking time, distance, shielding; system flushing; or other procedures.

2.4.7 Knowledge of event-based EOP mitigation strategies.
Survey: RO 3.5, SD .95 **SRO 4.1, SD 1.00**
Catalog: RO 3.1 **SRO 3.8**
History: Added in Rev 2 based on "EOP inspections." Regulatory bases are 41.10, which reads, "Administrative, normal, abnormal, and emergency operating

procedures for the facility," 43.5, "Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations," and 45.13, "Demonstrate the applicant's ability to function within the control room team as appropriate to the assigned position, in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments are not violated."
(FYI - 2.4.5 Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.
2.4.6 Knowledge symptom based EOP mitigation strategies.
2.4.7 Knowledge of event based EOP mitigation strategies.
2.4.8 Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.)
INPO exam database: W 2, CE & B&W 0
Comments:

- Thought all plants symptom based
- Our EOPs are symptom based, not event based.
- Use symptom based EOP's not event based
- Our EOP is symptom based.
- Re-write "event-based EOP mitigation strategies" to "event-based AOP mitigation strategies."
- Thought all plants symptom based
- Scope is right for event based EOPs, but event based EOPs are not used, therefore the K/A is not relevant
- Our EOP is symptom based.
- See additional comments to preceding question.
- Word as "Knowledge of EOP mitigation strategies."
- Very broad. This opens up every word ever written on this subject to testability for the Operator. Their specific site training may not have covered as deep as these questions might come.
- Thought all plants symptom based
- Again, event based EOPs are not relevant
- SRO responsible for strategy; both for implementation
- But close
- I am assuming this means event based abnormal operating procedures as EOPs are all symptom based
- Though all plants symptom based
- Event based EOPs are not relevant
- Use symptom based EOP's not event based no questions necessary
- Our EOP is symptom based.
- Other -> Also tested on operating test.
- My plant uses symptom based EOP mitigation strategies, so this K/A would not apply.
- Delete it.
- As with previous KA may be better to be included in E/APEs
- Hyphenate "event-based"

- Delete if no plants have event based EOPs
- My basic opinion is we need to keep the emergency K/A as they are.
- We use symptom based (ORGs) and function based (FRGs). They address events but are not event-based (diagnosed).
- This KA is Not Applicable. No plants that I know of use Event Based EOPs.
- If my assumption that this KA is addressing events like loss of vacuum or power losses, etc. is NOT correct then this is an insignificant KA because our EOPs are ALL symptom based
- Our EOP is symptom based.
- Change to read: Knowledge of event based AOP and EOP mitigation strategies.
- Combine K/A with 2.4.6.
- Combine with similar k/a
- None of the stations I work with have event based EOPs that I am aware of.

2.4.13 Knowledge of crew roles and responsibilities during EOP flowchart use.
Survey: RO 3.4, SD 1.19 SRO 3.8, SD 1.25
Catalog: RO 3.3 SRO 3.9
History: Added for Rev. 2.
(FYI - 2.4.12 is "Knowledge of general operating crew responsibilities during emergency operations," and 2.4.14 is "Knowledge of general guidelines for EOP flowchart use.")
INPO exam database: W 1, CE & B&W 0
Comments:

- Don't use EOP flow charts
- Don't use flow charts
- Flowchart use?
- Flowcharts are no longer used in our EOPs or OAs. Individual assignments can vary during an evolution. There are not specific assignments to crew members dictated by the EOPs.
- Not all plants have flow charts
- We do not use flowcharts.
- But think that "flowchart" should be deleted; should be applicable to all EOPs; in our case, only a couple are flowcharted
- EOP flowchart does not apply at our station.
- We don't use flowcharts
- We do not use an EOP flowchart.
- Delete "flowchart" from the K/A statement.
- We do not use flowcharts in EOP's
- PWR- no flowcharts here!
- My site does not utilize standard EOP role positions, based on resource availability
- We don't use flow charts.
- Not used at B&W plants
- I see this as redundant to 2.4.12 since emergency operations should be in accordance with EOPs; but like the wording "roles and responsibilities"
- We don't use flowcharts

- We do not use an EOP flowchart.
- Consider combining with K/A 2.4.12.
- Not used at B&W plants
- We don't use flowcharts
- We do not use an EOP flowchart.
- Not a required K/A
- SROs need to know more about Em. Dir function and Event Classification.
- Not used at B&W plants
- We don't use flowcharts
- We do not use an EOP flowchart.
- Other -> K/A also tested on operating test.
- Not a required K/A
- Also test in simulator
- Not used at B&W plants
- B&W plants don't use flow charts in the EOP and Abnormal Procedures
- Should be evaluated during the Operating Exam.
- We do not use an EOP flowchart.
- Site specific EOP exam
- Demonstrate in simulator exam scenario.
- I have never been exposed to EOP flowcharts (I'm PWR limited).
- [My site] does not use flow charts in the Diagnosis of EOPs
- Covered sufficiently in previous K/A 2.4.12. We do not use the flowchart so that has impact on my response.
- EOP flowcharts are not used here.
- Our plant does not use flow chart EOPs, so I can not comment.
- We don't have EOP flow charts, and even if we did this K/A is redundant to the other other K/As related to use of EOPs.
- We don't use EOP flowcharts
- I think this is referring to different EOP flowcharts than what our CE Plant uses.
- We don't use them at [my site].
- We do not use an EOP flowchart.
- Does not apply.
- I don't know
- Delete this K/A for [my site]
- Since we don't use flowcharts, I wasn't always certain of my opinion.
- Knowledge of crew roles and responsibilities during EOP usage.
- PWR - we do not use flowcharts for EOP implementation.
- We don't use flowcharts.
- Does any PWR use flowcharts? I have only CE experience, other than BWR.
- We don't use flow charts
- Not used at B&W plants

2.4.14 Knowledge of general guidelines for EOP flowchart use.
Survey: RO 3.2, SD 1.13 SRO 3.9, SD 1.25

Catalog: RO 3.0 SRO 3.9
History: Added in Rev. 2. Same bases as above.
INPO exam database: W 6, CE 1, B&W 0
Comments:

- Don't use EOP flow charts
- Don't use flow charts
- Flowcharts are no longer used in our EOPs or OAs. Individual assignments can vary during an evolution. There are not specific assignments to crew members dictated by the EOPs.
- maybe EOP/flowchart would be better
- Not applicable.
- We do not use an EOP flowchart.
- Delete "flowchart" from K/A statement.
- Flowcharts not used at [my site]
- Don't use flow charts
- Not used at B&W plants
- Not applicable.
- We do not use an EOP flowchart.
- Flowcharts not used at [my site]
- Not used at B&W plants
- Not applicable.
- RO needs to be familiar and SRO needs to have a strong working knowledge.
- SRO responsible for implementation; both must know guidelines for use
- Flowcharts not used at [my site]
- Not used at B&W plants
- Not applicable.
- B&W plants don't use flow charts in the EOP and Abnormal Procedures
- Also test in simulator
- Not used at B&W plants
- Should be evaluated during the Operating Exam.
- Delete this K/A
- [My site] does not use EOP flow charts
- EOP flowcharts are not used here.
- We do not use flowcharts for EOP's
- Again, feel "flowchart" should be deleted as restrictive; should know guidelines for use of all EOPs
- Same comment as previous question.
- We don't use EOP flowcharts
- We don't use flowcharts
- We don't use EOP flowcharts at [my site].
- We do not use an EOP flowchart.
- Does not apply
- What is EOP Flowchart?
- Delete this K/A for [my site]

- Eliminate K/A
- Combine with previous k/a
- PWR - we do not use flowcharts for EOP implementation.
- Combine with K/A 2.4.13.
- We don't use flowcharts.
- Again, flowcharts aren't used at my plant.
- We don't use flow charts
- Not used at B&W plants

2.4.15 Knowledge of communications procedures associated with EOP implementation.
Survey: RO 3.4, SD 1.01 **SRO 3.8, SD .87**
Catalog: RO 3.0 **SRO 3.5**
History: Added in Rev. 2
INPO exam database: 0
Comments:

- Is this asking about 3 way communications, if so delete
- Don't have multiple standards for communication
- Change "communications procedures" to "communications methods"
- Clarify it. communication procedures are what, how to talk, phonetic alphabet, what phones to use???
- It seems that ALL of these K/As associated with EP/AP usage can be combined into one....ability to correctly perform EP/APs.
- RO just needs to know we should be using it the SRO needs to supply it and ensure it works for him.
- Other - Also tested on operating test.
- Operator Requal exams
- Knowledge of procedures for communications are insignificant compared to the ability to communicate.
- Should be evaluated during the Operating Exam.
- Delete this from the K/A catalog. This K defines a purely administrative function and Management expectation that does not merit having its own K. This K is inherent in several other K/As.
- Assuming this means the formal line of communications that occur during EOP implementation.
- Are we talking about E Plan implementation?
- This K/A- is it talking about offsite communications during ERO actions? Is it talking about 3-way communications? I would need more guidance to make better decision on it.
- This must not be important because I know of no communication procedure associated with EOP implementation.
- This K/A is very unclear. Do plants have special communications procedures for EOP implementation? We have specific tailboard requirements for certain EOPs, but no specific communication procedure. Perhaps this K/A should read: Knowledge of

tailboard, three-way communication, and peer-checking requirements associated with EOPs.

- K/A should be the ABILITY to use these procedures.
- Clarify the expectation. Is this three-way communications or how to key a radio or how to notify local authorities if an EAL is entered?
- Communication during EOP implementation is evaluated during the performance exam. This not a knowledge area that needs to be tested on a written exam. (Not at the licensing level)
- Our communications protocols are used regardless of the type of procedures we are using at the time (we don't have special EOP comm procedures).
- Knowledge associated with EOP implementation.
- Most communications procedures apply all the time, not being limited to EOPs. That is, unless this is referring to communications with offsite agencies, in which case the distinction needs to be made between Emergency Plan Procedures and EOPs
- Also test in simulator.
- Are the requirements for communications different in the EOPs? This may have been in the past, but I'm not sure how applicable this is anymore.

2.4.37 Knowledge of the lines of authority during an emergency.
Survey: RO 3.2, SD 1.09 SRO 4.1, SD .9
Catalog: RO 2.0 SRO 3.5
History: Added in Rev. 2, based on 45.13, and as mentioned in NUREG 1021, ES-301. 45.13 reads, "Demonstrate the applicant's ability to function within the control room team as appropriate to the assigned position, in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments are not violated," so the link to this K/A is unclear.
This K/A was intended to refer to the transition of emergency authority as the emergency response organization (ERO) staffs up during the first hour after activation. A typical example would be the Shift Manager initially assumes the role of emergency coordinator after an event is classified. The SM is relieved by the TSC Coordinator - who is subsequently relieved by the EOF Coordinator. This line of authority may vary depending on the licensee's site-specific procedure.
INPO exam database: W 1, CE & B&W 0
Comments:

- This appears to me to be more of a Conduct of Operations type K/A
- Outside the Control Room names and roles change, inside the CR it is constant
- More of a Conduct of Operations K/A
- Totally irrelevant to handling emergency operations.
- Clarify: during Emergency Plan implementation
- Only SRO has E-Plan implementation expectations
- E-Plan
- Everyone on site needs to know and understand how this K/A functions.
- Maybe combine this K/A with 2.1.1
- Remove it.

- Not relevant. Lines of authority are internal and are hard to find written procedurally and are not relevant to a license process.
- Combine with a similar EOP k/a

ATTACHMENT 3: K/As that Require Different Knowledge/Ability for the SRO and RO Jobs

2.1.1 Knowledge of conduct of operations requirements.
Survey: RO Impt 3.8, SD .86 SRO Impt 4.2, SD .87
Catalog: RO Impt 3.7 SRO Impt 3.8
History: New in Rev 2
Comments:

- I would say mostly the same
- They are very similar but there are additional requirements for an SRO to fulfill
- SROs should always be held at a higher standard than ROs. It only makes sense.
- SRO's could have different administrative requirements.
- Expect SRO knowledge to be more in depth, especially for admin requirements
- The criticality is slightly higher for SRO.
- We have many procedures that cover this area.
- Not needed to recall from memory since these are available in an Administrative Procedure.
- While an RO is required to have some understanding of this topic, ultimately it is the SRO's responsibility to ensure the conduct is adhered to.
- K/A for group must be tailored to job responsibility
- Minor differences in the operator competencies for RO vs. SRO as defined in NUREG 1021
- More detailed for SRO level
- Although the SRO is required to adhere to further conditions
- Different aspects in job responsibilities/decision making
- SRO has more management responsibilities.
- The duties and responsibilities are different. The general guidelines require the same knowledge for both the RO and SRO.

Revise How?

- The conduct of ops is a moving target and it is important to know what it contains AND the basis for the content.
- As commented earlier, break it up into its core components. Such as, developing site specific procedures, administrative controls, organization, reporting requirements, etc.
- Delete this from the K/A catalog
- This is more of an administrative function and not really important to the safety of the plant.
- This knowledge and ability is too generic in nature.
- Keep it
- Expand this K/A to indicate if this is the plants managements operating requirements, i.e. when to trip the reactor, or skin temperature of the SG's prior to starting an RCP.

- Narrow the field. Perhaps provide examples of what Conduct of Operations encompasses.
- A poll should be taken of TWG members concerning major areas of conduct of ops, then look for common grounds as a way to divide the KA into smaller parts.
- The "generic" conduct of operations requirements needs to be better defined. Some of these already exist in the catalog, others may not. Each power plant has a "Conduct of Shift Operations" procedure that covers numerous requirements, from when to take actions to trip the plant, when to take manual control of an automatic system, etc... From the standpoint of a "Knowledge or Ability", this statement is more of a "group" of knowledges and abilities, with the exam writer able to ask a whole host of questions.
- Should be an "application" K/A. That is how to apply these requirements to specific issues/scenarios.
- Generically better written K/As should be provided, more detail and more focus. Across the industry each site interprets what is given in these brief K/As. By now we as an industry should have an understanding as to what is required for every K/A and have the ability to write it down in some detail. At my site we continue to change according to who sets in the control seat.
- I believe the K/A should be broken down into more specific knowledge requirements.
- Break this k/a into manageable categories
- Again refer to NUREG 1021 operator competencies. Major difference for SRO (vs. RO) is additional focus on Tech Spec requirements and Command and Control aspects of SRO job.
- This is rather vague as written. Should be more specific.
- This should specify exactly what is being asked. For our plant this is an [identifying information deleted], conduct of operations, question that could discuss the role of each position as well as educational requirements and job functions. This could also mean job duties of each position, reactor trip notification criteria, control room references available, switchyard ops, manning (which is covered by a different KA) and many other assundry items. I am never comfortable writing a question for this KA b/c it is so broad.
- This k/a is very vague. Conduct of ops requirements for this site tells operators how we do business at this station. Keep it general, but it should be only in the ro/sro site specific exams.
- Testable items should include big picture issues such as taking manual control of controllers, acceptability of pre-emptive actions, and annunciator response. These things may actually be best suited for evaluation on the simulator examination.
- Conduct of operations is primarily about the behavior our people exhibit. It shouldn't matter what setting is observed, the behaviors should be consistent. However, these behaviors are best observed in both simulated and actual operating plant situations.
- Add this to simulator training also
- This is a good K/A to have because it is wide open, allowing for examination of many different topics specific to each facility on how they do business.
- Delete it.

- The conduct of operations should be developed at the highest level. The requirements specified within the document should be carefully crafted and remain unchanged. Revision should only occur by the approval of the highest level of corporate responsibility and ownership for safe reactor operations. (Example: The conduct of operations as provided for the operation of the first commercial reactor: Shippingport Atomic Power Station, could only be amended/revised following approval of Admiral Rickover); Knowledge of this manual should be of the highest level. The compromise is the extent of diluting of the conduct of operations manual/requirement with non specific corporate instruction and lack of operating specifics. Corporate lack of responsibility to the mastery of the KIS (KEEP IT SIMPLE) principle as it applies to the conduct of operations.
- This K/A should be broken down into better defined areas.
- More specific in regards to specific areas of the conduct of operations such as peer checking, independent verification etc.

2.1.2 Knowledge of operator responsibilities during all modes of plant operation.
Survey: RO Impt 4.1, SD .80 SRO Impt 4.4, SD .73
Catalog: RO Impt 3.0 SRO Impt 4.0
History: Previously a System Generic K/A in Rev 0, with importance ratings that varied by system.
Comments:

- SROs require a higher level of proficiency and knowledge of the Defense in Depth analysis in Modes 5 and 6. RO required knowledge in these areas is significantly less than the SROs.
- ROs don't need the level of understanding of ITS basis that SROs need.
- ROs /SROs need to know their responsibilities and they do change during different modes of operation.
- An RO would be responsible for his/her duties only. An SRO would be responsible for knowing his/her duties as well as those of the RO
- RO's should know their responsibilities as well as the responsibilities of the NEO's they supervise. SRO's need to know all Operators' responsibilities.
- It is important for all levels or plant personnel to have knowledge of the responsibilities they fulfill, but, not all responsibilities are the same.
- SRO has responsibilities above and beyond that of the RO
- ROs do not have the same oversight responsibility as SROs
- Admin requirements are more strongly SRO responsibilities
- SRO's have been tested on "administrative knowledge" in cases where operators are not required to be knowledgeable.
- Different responsibilities
- SRO responsibilities differ from an RO.
- RO and SRO responsibilities change when plants enter Shutdown or Defueled modes.
- They both have to know what the others responsibilities are however this should not be in the K / A.

Revise How?

- This K/A can have 1,000 questions a broad range of operations, from CSD to full power operations and everything in between. Although this gives artistic liberty to the exam writer, the other aspect of this is tying this K/A to JPM's, scenario's, lesson plans, etc. By the way it is written, I can put this K/A as a reference to 90% of what is developed.
- Recommend breaking this K/A out into each operational mode.
- Need to focus on what types of areas of responsibility. KA is much too broad as written.
- Due to the complexity of our operations and maintenance activities during outage conditions, this K/A becomes a place where unreasonable questions get asked from very long maint. directive documents, need to keep this topic operator specific. We have added many processes to our station over the past 10 years and questions should come with reference materials.
- Again, like the first K/A, but this is actually worse. An operator's responsibility during all modes of operation? What does this encompass? This K/A could be covered by the first K/A in the catalog, and then deleted.
- Over the years I've spent in the industry it has been my experience that we have lost some expertise in this area. It seems the roles and responsibilities of the SRO and RO are not taught or develop as needed by our changing standards/expertise. When I entered the industry in 1973 candidates were developed and trained after experience was gained. Your current understanding and abilities held a great impact on the license you were trained and examined for. This provided insight and background for understanding the roles of a RO or SRO during all modes. Now candidates are chosen based on their ability to move up in the company with little attention given to their background for plant operation. This lack of plant skills equates to a lack of knowledge for personnel responsibilities to plant operations.
- I would recommend that this K/A be divided giving more specific knowledge requirements.
- Job specific
- Operator specific (RO & SRO) responsibilities related to key aspects of "Conduct of Operations" (ex. annunciator response during normal, abnormal and emergency conditions)should be identified by individual K/As.
- In the initial phase of the KA catalogue, I believe this was written for responsibilities of wheteher to trip, safety and health of the public issues, ramp down, ie. what am I expected to do to protect the plant and the public. Now it means much more and can include reactivity control issues, procedural adherence issues, shift manager oversight, SS oversight and other topics not envisioned 10 years ago.
- Seems pretty open-ended. Unless there are specific situation-dependent tasks identified in procedures, might be difficult to work into a written exam.
- The KA is too generic to identify importance ratings as these would vary greatly depending on the particular responsibility.
- Add "including defueled" at the end of the K/A since this is technically "No Mode."
- This K/A should be removed. It is essentially covered under many others and is overly broad. In addition it doesn't belong in a generic K / A.

- Emphasis should be specific to the requirements given in the 10CFR. Clear legal understanding that the SRO/RO license is the legal contract to protect the health and safety of the public and that you are accountable to the Congress of the United States.

2.1.4 Knowledge of shift staffing requirements.
Survey: RO Impt 2.9, SD .95 SRO Impt 3.8, SD .96
Catalog: RO Impt 2.3 SRO Impt 3.4
History: Added in Rev. 2
Comments:

- There are T.S. on this subject and SROs should know manning requirements.
- Actual staffing is not controlled by the RO but is controlled by the SRO.
- Best tested as a JPM
- RO & SRO for watch relief and SRO for over plant staffing
- RO's should have some knowledge of the requirements, as it applies to their role. SRO's should know the staffing requirements for everyone's roles.
- This req. is MET or NOT MET, SRO would direct filling void positions
- ROs must know the requirements regarding "at the controls" where as SROs must know the Tech Spec and administrative requirement for staffing the entire shift.
- The SRO is held to a higher level of responsibility for this KA than a RO.
- SROs are responsible for ensuring proper shift manning
- SRO's are more responsible for meeting the staffing requirements than RO's.

Revise how?

- I don't feel that knowledge of this K/A has much to do with safely operating the plant, it is more of an administrative knowledge.
- Delete this from the K/A catalog
- All candidates are required to know requirements for shift staffing for all modes of operation.
- Redundant to 2.1.5 (After I read 2.1.5 I came back and edited the review of this K/A. (You told me not to look at the NUREG)
- Overall, good K/A, specific and to the point.
- Reword: Knowledge of minimum shift staffing requirements to include 'at the control' requirements.
- I don't believe this K/A should be changed.
- Construct test questions that hold ROs responsible for RO manning requirements only OR apply to modes where an RO may have control room oversight responsibility.
- Shift staffing should be the responsibilities of an sro.
- It may be worthwhile to ask a question about T/S minimum staffing, but its pretty basic, and not particularly challenging. Staffing requirements are pretty well proceduralized. I don't see getting this right as much of a challenge to operators.
- Ask some outage specific questions on the exams due to the different (longer) work hours.
- Knowledge of site administrative and regulatory shift staffing requirements

2.1.8 Ability to coordinate personnel activities outside the control room.
Survey: RO Impt 3.4, SD .96 SRO Impt 4.1, SD .72
Catalog: RO Impt 3.8 SRO Impt 3.6
History: Was A1.10 in Rev. 0 with RO impt 2.9 and SRO impt 3.9*.
Comments:

- The SRO is basing the coordination using a broad view of the plant condition, whereas, the RO is more focused on their area of responsibility. The SRO must ensure that the ROs are coordinating their activities to the best efficiency obtainable.
- The RO may interface with one or more field operators, but his ability to clearly communicate is the issue. The topic also requires multi-discipline communication standards that are addressed at the SRO/Management level. SRO's coordinate resources.
- For an SRO, this coordination of activities encompasses a much wider scope, with much more outside group involvement
- Best tested on Operating Test
- In most cases RO coordination is more limited in scope
- SRO has more responsibility during emergency situations
- Primarily RO--SRO exercising oversight
- RO's - more individual direction, SROs - more resource management.
- More for SRO
- The SRO has overall command of the situation and delegates to the RO.

Revise How?

- This is general knowledge on resource management.
- Although I think it's implied, I think the K/A should state "Ability to coordinate Operations' related activities outside the control room."
- Way too broad. I envision breaking this down into knowledge of where Field Operators are required to be during particular activities, evolutions or emergencies and the ability to exercise judgment in making assignments from the control room.
- Applicable to practical exam only
- This is a supervisor's responsibility. I don't think it needs to be in the K/A catalog as it is limited in its role for nuclear safety
- The RO controls most AO activities on a daily basis but the SRO would control his movements more during critical Emergency evolutions.
- The only way to ask a question on this is to use a specific system or event. At that point it now becomes a system/event tied question which is supposed to be avoided in the generic realm. This is also a good candidate for a simulator tied KA, not so much for a question.
- Test on Operating Exam
- May not be needed. If operators can function in the control room why would they not be able to perform outside the control room. K/A is not specific enough.
- Best performed on the simulator.
- Delete this from the K/A.
- While this is an important ability - seems like it's not a testable topic.

- Evaluation of this K/A shall occur during simulator exam performance

2.1.10 Knowledge of conditions and limitations in the facility license.
Survey: RO Impt 3.6, SD .93 SRO Impt 4.5, SD .67
Catalog: RO Impt 2.7 SRO Impt 3.9
History: Added as new in Rev. 2. However, Rev. 0 included a System Generic K/A that read, "Knowledge of limiting conditions for operations and safety limits," with importance ratings varying by system and job. For example, for the Control Rod Drive System, RO impt was 3.7, SRO impt was 4.1*.
Comments:

- SROs need a high level understanding
- SROs should know them, ROs should be familiar with them.
- SROs and ROs must know Safety Limits and Limiting Safety System Settings. Both must know any and all conditions and limits in the license itself.
- RO's need to be able to recognize these conditions, SRO's need to be able to recognize and apply to required actions.
- more for sro
- SRO required to know more of basis and non-TS portion of license.

Revise How?

- ROs as well as SROs need to know operability concerns of equipment. The importance factor for ROs should be raised.
- Need to break this KA into specifics. Exactly what is being asked for here?
- Need additional focus on the Administrative Controls section of Technical Specifications.
- This needs to be more specific, there are thousands of conditions and limitations of the facility license.
- I would eliminate this K/A, as most OPERATIONAL limitations and conditions of the Facility License have already been incorporated into the Facility's Technical Specifications
- Very broad, are we talking about Tech Specs? FSAR? Some additional words could point the exam author and the program administrator in the right direction.
- This K/A does not make any sense. It needs to be more concise as to what it is asking.
- Do not understand what the KA is looking for.
- This is very broad in scope. The focus areas need to be specifically identified.
- Change this to Knowledge of LCO applicability and remove it from the sample plan to sample with each system and erg/aop. This should be tested only at the generic level.
- SROs need to have more basis knowledge than ROs.
- The type of questions asked under this K/A should be limited to significant and readily recognized conditions/limitations. This K/A could easily be misconstrued to become an "ooly" hunt.

2.1.12 Ability to apply technical specifications for a system.
Survey: RO Impt 3.4, SD .82 SRO Impt 4.7, SD .45
Catalog: RO Impt 2.9 SRO Impt 4.0
History: Added as new in Rev 2. Somewhat related System Generic K/As in Rev 0 included, "Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications," "Knowledge of bases in tech specs for limiting conditions for operations and safety limits."
Comments:

- SRO's are responsible for implementation
- SROs must be able to make fine distinctions in their operability determinations. ROs only need broad understanding.
- RO's have limited involvement with tech spec determinations at the plant.
- higher for SRO
- I see this as a key difference in the responsibilities of ROs vs. SROs; this is SRO
- operability issue are ultimately the responsibility of the sro supervisor
- ROs should be required to know when they are in a condition that places them in an Action Statement, but they should not need to have the ability to track the time requirement (except for < 1 hr TS).
- The SRO requires the ability to use the Tech Spec Bases documents also.

Revise How?

- Though the ROs need to know entry conditions, they are not necessarily required to know the actions required once the TS is entered. This is more of an SRO K/A.
- For ROs is it more an understanding of the Tech Spec. For SROs it is application of the Tech Spec.
- SROs should subjected to additional exams that focus in detail in this area. More I look and think about this the more I see this a theme I have gone back and added information in some cases and placed the information the wrong blocks else where. The industry needs to train a lot of generic issues for SROs outside of the way we have been doing business.
- Apply is an SRO ability
- Less significant for ROs than SROs but still reasonable for both exams
- RO's should have a fundamental knowledge of how to apply tech specs. The sro should be the ones to apply the actual tech specs. Test the ro's on the fundamentals and the sro's on the specifics.
- Scope applies to all licensed operators however, the SRO is in charge of all implementation with the RO backing him up and knowing what to tell him
- Ability to determine operability issues and apply technical specifications for a system or component
- K/A may need to be divided into two different K/As to differentiate that ROs do not need to have the skill to track greater than 1 hour action statements. ROs should simply be required to know when they have met the entry conditions for action statements that are greater than 1 hour.

2.2.23 Ability to track limiting conditions for operations.
Survey: RO Impt 3.1, SD .87 SRO Impt 4.3, SD .67
Catalog: RO Impt 2.6 SRO Impt 3.8
History: Added in Rev. 2.
Comments:

- ROs must recognize when an LCO is entered. SROs need to determine when it expires.
- Tracking LCO's usually an SRO function
- SRO only can initiate LCO and has responsibility for compliance; both can track
- ROs should not be responsible for tracking > 1 hr action statements.

Revise How?

- Essentially, this could be combined with the previous K/A.
- I wish this survey gave me a way to rate the difficulty of some of these items. Several of the K/As listed are important, but trivia. This survey as constructed makes it hard to say 'Yeah this is important but not worth testing.'
- this is an in plant or sim KA
- Remove from generic and make this for systems with TS applied to them.
- This should be tested on the simulator or on a JPM

2.2.25 Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.
Survey: RO Impt 3.2, SD .84 SRO Impt 4.2, SD .68
Catalog: RO Impt 2.5 SRO Impt 3.7
History: Was a System Generic K/A in Rev. 0, with importance ratings varying by system. For example, for the CVCS, RO impt was 2.7, SRO impt was 3.6. For a Reactor trip, RO impt was 2.8, SRO impt was 3.9.
Comments:

- RO, 1 hour or less LCOs
- SRO must be able to make operability decisions
- ROs should know some Basis info for very important LCOs, but not as much as SROs. I am not sure how to incorporate this comment.

Revise How?

- Change the K/A to read: Knowledge of technical specification bases for limiting conditions for operations and safety limits.
- The K/A should state that the knowledge is required given a reference.
- Too broad in scope (all LCO bases?)
- This needs to be split in to bases for all TS and then safety limits or knowledge of the bases for just the safety limits. Since nureg-1122 in section 1.4 on page 1-3 has SRO written items and lists 7 SRO items from CFR 55.43 (b), and number 2 is facility operating limitations in the technical specifications and their bases, this KA appears to double dip into that category. If we apply 1.4 as it is now being applied across the board for SRO questions, it may be we need to limit this objective to just the bases of the safety limits portion of TS.

- The KA should be split into one for safety limits and individual system KAs for limiting conditions for operation. Having only one KA limits the number of Tech Spec questions that can be on an exam.
- Combine with tech spec k/a
- I am not sure how to formulate this into a set of K/As, but ROs should not be held to the same level as SROs wrt TS basis knowledge; however, ROs should be required to know some of the more important TS basis info.

2.2.26 Knowledge of refueling administrative requirements.
Survey: RO Impt 2.8, SD .85 SRO Impt 3.9, SD .80
Catalog: RO Impt 2.5 SRO Impt 3.7
History: Added in Rev. 2
Comments:
- SRO responsible for oversight
- Refueling SRO position requires more knowledge.

Revise How?
- This could be broken into many aspects of refueling operations. Such as; refueling shutdown requirements, refueling (moving fuel) requirements, refueling containment integrity requirements, etc.
- SROs really need to know this stuff.
- As an SRO, I was licensed to handle fuel. Yet I was NEVER on either fuel handling bridge and knew very little about it. I recommend excluding fuel handling from the authorities granted under the RO and SRO license. Fuel handling should be a separate and distinct license or certificate.
- The RO/SRO role in Fuel Handling has changed to such a degree that any questions on the subject are of relative insignificance.
- It should be made clear that the Administrative requirements are related to systems.
- At our site ROs have very limited involvement in refueling activities.
- Discuss limited SRO licenses for refueling and whether all SRO's should be tested?
- ROs need to know much of what the SROs need to know because they are qualified to move fuel and need to know how their job interfaces with the Refuel SRO.
- Separate this into a separate refueling K/A for those getting refuel SRO licenses ONLY and generic refueling conditions from an operational standpoint
- Refueling has become specialized. The Initial SRO License exam should probably be pretty generic.

2.2.27 Knowledge of the refueling process.
Survey: RO Impt 2.8, SD .84 SRO Impt 3.7, SD .75
Catalog: RO Impt 2.6 SRO Impt 3.5
History: Added in Rev 2.
Comments:
- All Operators need to have this knowledge.
- SRO have more admin responsibilities.
- Fuel Handling SRO has different responsibilities than RO's

Revise How?

- There are several aspects to refueling. Maybe it could be more specific, such as "Knowledge of core design and fuel movement processes."
- Every SRO and RO must have an iron-clad understanding of the fuel status at all times. That includes the ability to operate the cooling systems under normal, abnormal and emergency conditions. However, only those ROs and SROs actively engaged in refueling operations need to fully understand the fuel handling mechanisms. For licensed operators who do not handle fuel, a general understanding is sufficient.
- For those of us who use LSROs, we may look at this differently.
- Refueling SRO positions would be chosen from this group. Additional training is routinely provided, to SROs chosen to fill these positions, just prior to the beginning of the refueling.
- At our site ROs have very limited involvement in refueling activities.
- The KA needs to be more specific. Does it mean only core alterations or the process from receiving new fuel to core load?
- The part of this K/A that should be tested is not the actual movement of fuel but the activities to prepare for movement of fuel and recovery afterward. Fuel movement is performed by another group (on our site) under the supervision of a Fuel Handling SRO.

2.2.32 Knowledge of the effects of alterations on core configuration.
Survey: RO Impt 3.0, SD .95 SRO Impt 3.6, SD .93
Catalog: RO Impt 2.3 SRO Impt 3.3
History: New in Rev 2 and based on 43.6, which reads, "Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity."
Comments:

- SRO only

Revise How?

- Delete this from the K/A catalog
- I am not sure what this KA is asking. Possibly should be deleted.
- This K/A is too broad. As written, a question asking an applicant to calculate Keff after adding a fuel bundle can be justified. What's important is the potential for going critical, what to do if count rate begins increasing, alarms, evacuation, decay heat removal. The K/A should be narrowly tailored to include the functions under the operators' control and exclude functions for which operators have no influence.
- This is a poorly worded K/A. The K/A implies: How is core configuration affected by alterations? What the K/A should address is: How does altering the core configuration affect the operating characteristics of the core? I would reword this K/A to read: "Knowledge of the effects of core configuration alterations on the core operating characteristics.
- The K/A should state "during refueling".

- The use of both alteration and configuration can confuse. We use the term core alterations, not core configurations.
- Reactor engineering is responsible for alterations of the core configuration.
- Re-write K/A as follows: "Knowledge of the effects on the plant of performing core alterations."

2.3.8 Knowledge of the process for performing a planned gaseous radioactive release.
Survey: RO Impt 3.1, SD .95 SRO Impt 3.7, SD .80
Catalog: RO Impt 2.3 SRO Impt 3.2
History: New in Rev. 2, based on 43.4, "Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions," and 45.10, Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized, and ability to perform other procedures to reduce excessive levels of radiation and to guard against personnel exposure."
Comments:
- Many release paths are initiated by AO's, not RO's
- The RO needs to know that a permit is required. The SRO needs to know when, how and why one is required and what to do when a discharge permit is not used.
- SRO oversight; performed from outside MCR at this site.
- SROs have more approval responsibility - admin knowledge.
- Delete this K / A. We don't, and have not ever that I know of, done this.

Revise How?
- Performed by personnel from another department (not operators); operators complete the lineup only. Remove from K/A catalog.
- Delete this due to double jeopardy.
- Delete this K / A. We don't and have not ever that I know of done this.

2.4.6 Knowledge symptom based EOP mitigation strategies.
Survey: RO Impt 3.7, SD .78 SRO Impt 4.4, SD .72
Catalog: RO Impt 3.1 SRO Impt 4.0
History: Added in Rev.2
Comments:
- RO's know HOW; SRO's know WHY.
- SRO is responsible for mitigation strategy; both for implementation
- but not much different

Revise How?
- Knowledge "of" symptom based EOP mitigation strategies.
- Wolf Creek uses symptom based EOP mitigation strategies versus event based strategies. I thought all plants had gone to symptom based strategies.
- This may be better tested in E/APEs not as part of the generics
- Change this K/A to read: Knowledge of symptom-based EOP mitigation strategies.

- With the exception of Yellow path, lower tier, mitigation strategies. These are not very high on the cognitive level for ROs and SROs.
- Think the word 'of' is missing from description.
- I assume we're talking ORG MACs (or similar).
- Include SRO requirement to understand bases & background
- Combine K/A with 2.4.7.
- Add "of" after knowledge.

2.4.8 Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.
Survey: RO Impt 3.6, SD .87 SRO Impt 4.2, SD .84
Catalog: RO Impt 3.0 SRO Impt 3.7
History: Added in Rev 2.
Comments:
- Strategy for integrating use of multiple procedures lies with SRO

Revise How?
- To my knowledge, there is no specific strategy for addressing this. We have strived to make all of our AOPs, and EOPs symptom-based. Understanding the hierarchy of procedures is what this should really be addressing (and maybe that's what it's saying).
- If we are only using symptom based procedures, this would be a mute point.
- Not sure about the intent or value of this KA.
- Delete this ka
- Delete K/A, along with 2.4.6 and 2.4.7 and make one generic K/A of "Knowledge of EOP mitigation strategies."
- Test in simulator
- Could this be covered by 2.4.5?
- In many ways this is the true basis for the mitigation strategy of the EOP network. The K/A could very well be expanded to include a significant discussion of the philosophy differences between the two types of procedures.

2.4.16 Knowledge of EOP implementation hierarchy and coordination with other support procedures.
Survey: RO Impt 3.5, SD .92 SRO Impt 4.4, SD .63
Catalog: RO Impt 3.0 SRO Impt 4.0
History: Added in Rev 2.
Comments:
- More specific to SRO
- Coordination (integration) of support procedures is SRO responsibility

Revise How?
- Good one!
- More of an SRO knowledge than RO

- This KA repeats in different words the same fundamental knowledge of EOP and AOP layout and use together. Delete or define scope more specifically
- I am guessing that this KA is targeting EOP interface with other procedures--but I shouldn't have to guess.
- Eliminate
- You see, this is a good generic knowledge item.

2.4.18 Knowledge of the specific bases for EOPs.
Survey: RO Impt 3.3, SD .80 SRO Impt 4.0, SD ..72
Catalog: RO Impt 2.7 SRO Impt 3.6
History: Added in Rev 2
Comments:

- SROs required to know more bases type stuff.
- SRO needs to understand the bases so he can use judgment in directing the ergence in moving through the procedures.
- ROs sometimes need to help the SRO prioritize.
- The SRO should be more familiar with the material as he directs the flow path through the EOPs but the RO should have an understanding also.

Revise How?

- Delete this KA and include under specific EPEs

2.4.22 Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.
Survey: RO Impt 3.6, SD .79 SRO Impt 4.4, SD .68
Catalog: RO Impt 3.0 SRO Impt 4.0
History: Added in Rev. 2.
Comments:

- SRO responsible for mitigation strategy, including which procedure(s) should be implemented; sequentially or concurrent

Revise How?

- B&W plants don't use/recognize Critical Safety Functions. However, prioritizing do to hierarchy/importance to safety is done. The hierarchy is built into the EOP.
- If this means when I would go to a red/orange path, this is covered in previous KAs and in the EPE sections. This is not a necessary KA.

2.4.23 Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.
Survey: RO Impt 3.4, SD .74 SRO Impt 4.4, SD .67
Catalog: RO Impt 2.8 SRO Impt 3.8
History: Added in Rev 2.
Comments:

- See comment on previous K/A; I see redundancy since EOPs are used to address degradation of safety functions

- SRO are in the prioritization business, RO's implement

Revise How?

- The SRO must understand the prioritization scheme and the background information on the procedure implementation. The RO does need this knowledge so as to be an asset to the team.
- Instead of the knowledge for the bases, the K/A should be the ABILITY to prioritize.
- Needs a little clarification as to the K/A expectation. I envision that an SRO needs to understand this if the need arises to do something not in strict compliance with the EOPs.
- The reason exam questions are not written for this K/A is that it is not clear what "the bases for prioritizing" means. The procedures are already prioritized and no evaluation is needed by the licensed operator. This may no longer be applicable to the way we operate.
- Combine with other EOP K/A s
- Combine with similar k/a's

2.4.28 Knowledge of procedures relating to emergency response to sabotage.
Survey: RO Impt 3.1, SD .91 SRO Impt 4.0, SD .82
Catalog: RO Impt 2.3 SRO Impt 3.3
History: Added in Rev 2.
Comments:

- SRO only responsibility to implement this procedure.
- SROs will have more communications responsibilities with outside organizations, etc.

Revise How?

- Due to heightened security awareness at all nuclear plants, this K/A needs to be increased in Importance factor.
- I understand 9-11 paranoia but I don't agree with it. Worthless subject
- This is an area to be expanded on with the new requirements and procedures associated with security. This area has taken on a much more important function.
- Security is such a big issue not sure we have the information or need the info to test on.
- The operators will still have to respond to the plant. Beyond notifying and working with security I am not sure if I really understand what this is getting at. I guess in general I am not sure it is that important.
- This question can inadvertently reveal safeguards or sensitive security information due public nature of the exam in government records. This should not be tested on license exams.
- Combine with similar k/a
- This could be expanded, in light of 9/11.
- If you know the responses due to accident, then actions taken to respond to sabotage are understood - but performed in a different manner.

2.4.29 Knowledge of the emergency plan.
Survey: RO Impt 3.1, SD .86 SRO Impt 4.4, SD .65
Catalog: RO Impt 2.6 SRO Impt 4.0
History: Added in Rev 2.
Comments:

- Pretty much SRO Only
- ROs, if they have any responsibility, need only understand those responsibilities assigned to them.
- SROs only are responsible for filling in for the SEC-MCR if necessary. ROs have no E-Plan specific role other than to implement plant procedures excluding PEPs
- SROs will make event classifications and serve as Em. Dir. ROs need to be aware of parameters that SRO will need to classify event.
- SRO's more involved with initiation and activation

Revise How?

- KA is too broad - needs to be defined better
- May be too broad. Should be rewritten to better define scope for RO and SRO knowledge
- Very limited knowledge required for ROs.
- sro only

ATTACHMENT 4: Recommendations for New K/As from Survey Participants

New KA 1

- There is no K/A which mentions Risk Assessment. The NRC is very focused on this- there should be a K/A to interpret/recognize risk significant components and Operator Actions.
- Knowledge of events which are required to be reported to the NRC.
- more k/a'a are needed for daily normal ops. I realize your testing for the accident of 10E-8 but if you train and test for daily ops emergency stuff will be easier to understand and perform. Just my opinion.
- Knowledge of plant-specific transition criteria from EOPs to Severe Accident Management Guidelines.
- Knowledge of clearance and tagging (switching and tagging) procedures.
- none
- There should be a K/A for the operator interface with the work control system since there is a constant interface between the operator and the maintenance personnel at the station.
- None
- Knowledge of the principles and application of Conservative Decision Making
- For Section 2.1 "knowledge of plant safety procedures which apply to operations personnel functions"
- Knowledge of Risk based maintenance planning. (PRA)
- interprate and implement dual column format procedures during abnormal plant operatiions
- Section 2.1 Knowledge of equipment/system operability vs. functionality
- Knowledge of reactivity control requirements
- Knowledge of Control Room Access Control.
- Assessing core damage.
- K/A of the effects of natural circ cooldown and the ability to determine adequate energy removal
- Ability to calculate Estimated Critical Conditions for reactor startups
- Knowledge of procedural requirements for instrumentation or component failures
- Knowledge and ability on how to obtain and apply OE.

New KA 2

- Ability to predict the risk impact of maintenance per station procedures implemented to comply with 10 CFR 50.65(a)(4).
- Ability to identify and interpret diverse indications to validate the response of another indicator

- Knowledge of conditions requiring facility management notification and attendant documentation.
- 2.1 Off site dose calc. manual as it affects equipment/system operability (eg rad. monitors)
- Knowledge of 10CFR55 regulations for maintenance of an RO/SRO license, including maintaining an active license, changes in medical condition, and continuing training requirements.
- Ability to meet Reportability time requirements.
- Mitigating Core Damage
- K/A of the control of steam bypass during forced and natural circulation cooldown
- Ability to monitor the approach to criticality using Main Control Board indications
- Ability to operate the facility to mitigate instrumentation or component failures
- Knowledge of site security plan and procedures

New KA 3

- Ability to determine event reportability and make necessary reports to government agencies.
- Knowledge of the expectations for procedure adherence, including expected action in response to an identified deficiency
- 2.2 knowledge and procedures associated w/ solid plant operations
- Ability to determine operability / availability of safety related equipment.
- Knowledge of Hazardous Material control/spill procedures.
- Operating with a damaged core.
- K/A of the steam bypass system in detail..using all available control room indication
- Ability to monitor the approach to criticality using an Inverse Count Rate Ratio (1/M plot)
- Knowledge of the requirements for and process to make operability calls

New KA 4

Knowledge of the principles and application of Human Error Reduction Tools/Techniques
Knowledge of the Basis for Continued Operation process.
Ability to determine when it is appropriate to shutdown the unit.
K/A Use of the emergency boration/ reactivity control schemes with the ability to equate the changes in reactivity to normal control schemes
Ability to complete paperwork for dose extensions [NOTE: this is normally a health physics function - usually a supervisor - need to add K/A so NRC doesn't require ROs or SROs to complete on NRC exams]

New KA 5

- Knowledge of the principles of effective Teamwork. plus one I am squeezing in: Knowledge of expectations for minimizing control room distractions.
- Knowledge of a licensed operator's role in the Probabilistic Risk Assessment program.
- K/A Implement the actions in response to terrorist attack.

ATTACHMENT 5: WOG TWG Workshop Participants

Charles W. Sawyer, Jr. (Chair)
10 years in Operations Dept. at McGuire Nuclear Station
10 years in Operator Training
5 years in Work Control
Chair of the WOG Operations Subcommittee
Member of NEI Operator Licensing Task Force
Qualifications:
Licensed as RO and SRO;
Authored 9 NRC exams since 1996.

Richard D. Brigdon
Westinghouse Classroom & Simulator Instructor 1982 - 1987
NRC Senior Reactor Operator Instructor Certification - Certified to teach all Westinghouse PWRs - 1983
Vogle Electric Generating Plant 1987 to present
Instructor - 1987 to 1991 (Initial and Continuing Training - Simulator and Classroom
NRC Senior Reactor Operator License - Vogtle Electric Generating Plant - 1990
Control Room Supervisor 1991 - 1995 - Vogtle Units 1 & 2
Operations Procedures Supervisor - 1995 - 2000
Sr. Operations Instructor - Vogtle Operator continuing Training Programs
Experience writing and supervision of developing pre-license audit exams per NUREG-1021, reviewing NRC developed license exam materials.

John Brown
7 years Nuclear Navy (3 as an Instructor
15 years Commercial Nuclear Plant experience (4 in Operations, 11 in Operations Training)
Initial License Training since 2000, ILT Lead for 1 year.
Member of the WOG TWG for 1 year.

Paul Hippely
Currently Braidwood Initial License Training Lead Instructor;
Previously Braidwood Requalification Instructor and Requalification Exam Developer;
Exelon/NRC Exam Development Coordinator - Wrote or assisted in developing 16 Initial License Examinations PWR and BWR;
Braidwood Initial License and Requalification Classroom and Simulator Instructor.
SRO Certification.
Navy Nuclear Power program for 8 years.

Tom Hunt
Twenty-two years experience in training and operations at BWR and PWRs.
Currently Operations Training Supervisor, St. Lucie Plant, Florida Power & Light Co.;
Previously Operations Training Supervisor and Simulator Instructor, Plant Hatch, Georgia Power and Kewaunee Plant, Nuclear Management Co.;
Contract Simulator Instructor, Susquehanna SES, PPL, WNP-2, WPPPS;
Contract License/Requal Exam Developer, Brunswick Plant, Carolina Power & Light;
Licensed Operator Examiner, EG&G Idaho.
Qualifications:
SRO license, Plant Hatch (GE-BWR);
SRO certifications:
Plant Hatch (GE-BWR);
Susquehanna SES (GE-BWR);
Kewaunee Plant (W-PWR).
Operator Licensing Examiner, NRC.
License exam and company audit exam development using NUREG-1021 back to revision 4.

Thomas E. Kuhar
Staff Nuclear Specialist
RO License for BVPS Unit 1 for 3 years (1976-1979)
SRO License for BVPS Unit 1 for 25 years (1979-2004)
Currently hold an SRO Instructor Certification for BVPS Unit 1 (2004-present)
Non-licensed Operator at BVPS for 2 years
Reactor Operator at BVPS for 3 years
Operator Training at BVPS for the last 26 years as an Operations Instructor, Training Supervisor, ILO and LOR Lead
Responsible for overseeing development of training material and examinations based on the KA Catalog for both licensed operator initial and requalification training. I have been involved in operator training since before the KA Catalog was first issued and have both used it and trained/coached others on its use since then.
WOG Training Group and MANTG Operations Subcommittee representative for BVPS for many years.

Steven Miller
SRO Certified Instructor - Salem Unit 1 and 2(Three Years 2002-2005)
B.S. Nuclear Engineering, Rensselaer Polytechnic Institute
US Navy Nuclear Operator (7 Years) Watch
Supervisor (2 Years) Operations Instructor (4 Years)

Gary Ohmstede
Plant Instructor - nuclear
Farley Nuclear Plant
Licensed SRO and plant operator for 4 years
Plant instructor for 7 years

Involved in 5 written exams: wrote 1 rev 9 draft exam in a secondary role of learning and reviewing the exam.
Reviewed 2 rev 9 draft exams as lead examiner for facility
Wrote 2 rev 9 exams in the past year as lead examiner for facility

Joe Smith
03/17/03– Present: Completed SRO Certified Westinghouse Instructor (8/07/04) at Kewaunee **(W-PWR),** WI. Initial License Class Program Administrator. Maintain Task to Training matrix. Classroom & Simulator Instructor. Outage Containment Coordinator for 10/04 Split Pin Replacement and Core Barrel IST work.
09/02/02-12/19/02: Perry Power Station (**BWR-6**), OH, - STA Program Lead. Compiled, modified, and delivered NRC Biannual Operator Requal Exam (Part A "Static," and part B "Written"). Developed STA Specific Lesson Plans.
04/01/02-08/30/02: Hope Creek Plant (**BWR-5**), NJ - Initial License Class Instructor. Taught GFES, and Systems Lessons until the students began their Simulator Normal Operations Scenarios.
8/20/01-03/29/02: Perry Power Station (**BWR-6**), OH, - Initial License Simulator & Classroom Instructor. Joined class while they were on OJT. Reviewed Simulator Scenarios. Taught in Simulator and Classroom through, and including the NRC Audit Exam.
01/2001-07/2001: Pilgrim Power Station (**BWR-3**), MA, - SRO Cert Program, develop, prepare and present materials. Classroom, and Simulator Operator.
11/1998- 01/2001: Clinton Power Station (**BWR-6**), Ill, - Initial License Class, develop, prepare and present materials. Classroom, OJT, and Simulator Floor Instructor.
09/1998- 11/1998: Brunswick Nuclear Plant (**BWR-4**), NC, - Lead instructor for a 10 week INPO BWR SRO Certification Class. Simulator Floor and Classroom Instructor. Certified 4 INPO Employees.
04/1998- 08/1998: Hope Creek Plant (**BWR-5**), NJ - Initial License Instructor (Classroom & Simulator). Joined class in the Simulator during Startup Certifications, and left after NRC Audits.
12/1991-04/1998: Brunswick Nuclear Plant (**BWR-4**), Southport, North Carolina

- Instructor. Maintain SRO Certificate. Using a variety of software programs, develop, prepare, and present materials IAW the SAT process, to initial licensed operator candidates and engineers. Qualified in the Classroom and Simulator.
- 1998 Hot License Class Instructor.
- 1997 Lead instructor for the Engineering Support Program:
- Participate as a student in the simulator as part of a staff operating crew.
- Senior Fuel Supervisor. Posses and maintain Limited Senior Reactor Operator License (LSRO). Supervise contract crews in the removal, re-insertion and verification of the reactor core fuel assemblies. Pass annual NRC written and performance based examinations to maintain LSRO.
- Emergency Communicator. Maintain annual test and drill requirements and be available by pager during assigned crew duty week to act as an Emergency Communications Director in the Technical Support Center (TSC). Pass annual examination to maintain requirements.

1987-1991: New Hampshire Yankee, Seabrook, New Hampshire (Westinghouse **PWR**)

- Instructor. Developed, prepared, and presented materials to Auxiliary Operators and Licensed Operator candidates in the classroom and in the simulator.
- Job Performance Measures (JPM) Writer. Created, drafted and issued JPMs', in accordance with approved guidelines, for use during the annual licensed requalification examinations.

1982-1987: San Onofre Nuclear Power Generating Station, San Clemente, California (Combustion Engineering **PWR** - Unit 3)

- Testing On Shift Supervisor. Acted as the operation department representative in discussions with Bechtel Power Corporation to complete hot functional testing requirements prior to fuel loading on the unit #3 reactor. Advised Bechtel and Southern California Edison employees during testing.
- Procedures Supervisor. Supervised SCE Operations and contract procedure writers for Units 2 and 3.
- System Description (SD) Writer. Developed materials used by engineers and operators to understand the operation and design of the plant systems. The job consisted of writing material and routing the drafts to engineers and operators for comment. Resolved comments for final approval by station management.

1970-1982: Maine Yankee Atomic Power Company, Wiscasset, Maine (CE/Westinghouse **PWR**)

- Shift Superintendent. Supervised the RO and SRO and operations crew. Acted as the Senior Emergency Coordinator during emergencies.
- Reactor and Senior Operator. Operated the reactor in accordance with license requirements. Directed an operating crew of 5.
- Fire Brigade Leader. Directed the actions to prevent and extinguish fires. Supervised a fire brigade of 4 workers.

1968-1970: Gulf General Atomic, San Diego, California (GGA **Test Reactors**; TRIGA Mark I, TRIGA Mark F and TRIGA Mark III)

- Senior Reactor Operator TRIGA Mark I. Operated the reactor in accordance with the unit physicist and laboratory personnel while conducting non-destructive criminal investigations.
- Senior Reactor Operator TRIGA Mark F. Operated the reactor in a pulse mode to test electronic circuits for use in the space program.
- Senior Reactor Operator TRIGA Mark III. Operated the reactor for steady state power production (Thermionics).

ATTACHMENT 6: Recommendations for Revisions to K/As

Table 1: K/As Recommended for Revision or Deletion

Current K/As	Survey Ratings		Catalog Ratings		Problem	Suggested Revision	Rationale for Change
	RO	SRO	RO	SRO			
2.1.3 Knowledge of shift turnover practices.	3.5	3.6	3	3.4	Importance ratings for SRO job had an SD = 1.0.	2.1.3 Knowledge of shift or short-term relief turnover procedures.	Change made to clarify the scope of the knowledge involved by including two examples. "Or" used to indicate that an exam question need not address both examples.
2.1.4 Knowledge of shift staffing requirements.	2.9	3.8	2.3	3.4	Not applicable to RO job.	2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, etc.	Change made to increase the applicability to the RO job.
2.1.5 Ability to locate and use procedures and directives related to shift staffing and activities.	2.85	3.8	2.3	3.4	SD > 1 for RO and SRO ratings. Meaning of "and activities" unclear. Comments indicated this K/A should be applicable only to SRO.	2.1.5 Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.	Change made for clarification and to indicate that this K/A is applicable only to the SRO job.
2.1.6 Ability to supervise and assume a management role during transients and upset conditions.	2.4	4.7	2.1	3.4	SD > 1 for RO job. Commenters objected to "upset conditions."	2.1.6 Ability to manage the control room crew during plant transients.	Determined to be applicable only to SRO job, but revised to simplify it.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.1.14 Knowledge of system status criteria which require notification of plant personnel.	2.9	3.9	2.5	3.3	SD for RO rating > 1. Comments indicated that the intended meaning of this K/A was unclear.	2.1.14 Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc. (CFR 41.10 / 43.5 / 45.12)	Change made to clarify the meaning of the K/A and its applicability to the RO job.
2.1.15 Ability to manage short-term information such as night and standing orders	2.7	3.3	2.3	3	SD > 1 for RO and SRO ratings. Comments indicated intended meaning of this K/A was unclear.	2.1.15 Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.	Revised to clarify intended meaning of the K/A.
2.1.16 Ability to operate plant phone, paging system, and two-way radio	3.2	3.2	2.9	2.8	SD > 1 for RO and SRO ratings. Comments indicated the K/A is "too basic" for testing.	Delete.	This ability is adequately addressed in K/As 2.4.43 and 2.1.14 and is evaluated in all other operator tasks that require sharing of information outside the control room.
2.1.19 Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3	3.9	3.9	3.8	Meaning of "parametric" unclear in this context.	2.1.19 Ability to use plant computers to evaluate system or component status.	Editorial change for clarity.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.1.21 Ability to obtain and verify controlled procedure copy.	3.5	3.5	3.1	3.2	SD > 1 for both RO and SRO ratings. Comments indicate this ability is "too basic" for testing and that computerized procedures make the "obtain" portion obsolete.	2.1.21 Ability to verify the controlled procedure copy. (CFR: 41.10)	Simplified to emphasize the important ability, which is the ability to verify that the procedure is the most recent revision. "Obtain" is assumed.
2.1.25 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.	2.8	3.1	3.3	3.6	"Monographs" is a typo - should be "nomographs." Reviewers believe "obtaining" reference materials is a precondition for interpreting them, so is unnecessary. Examples listed in the K/A are incomplete.	2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.	Editorial change for clarity.
2.1.29 Knowledge of how to conduct and verify valve lineups.	3.7	3.6	3.4	3.3	SD for RO job > 1. Comments suggested increasing the scope of the K/A.	2.1.29 Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.	Increased the scope of the K/A to clarify its applicability to the RO job.
2.1.34 Ability to maintain primary and secondary plant chemistry within allowable limits.	2.6	3	2.3	2.9	SD for SRO job > 1. Operators' responsibility for "maintaining" plant chemistry has decreased over time.	2.1.34 Knowledge of primary and secondary plant chemistry limits.	Licensed operators must know chemistry limits, but Chemistry department determines the actions that operators implement to "maintain" plant chemistry.
2.2.3 Knowledge of the design, procedural, & operational differences between units.	3.7	3.8	3.1	3.3	SD > 1 for RO rating.	2.2.3 Change parenthetical to (multi-unit license) from (multi-unit). Do not re-rate, use the survey importance ratings from multi-license sites only.	Response variability was the result of raters from single unit sites. The SD decreased below 1.0 when ratings from only mulit-unit license sites are used.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.2.4 Ability to explain variations in control board layouts, systems, instrument and procedural actions between units at a facility.	3.5	3.5	2.8	3.0*	SD > 1 for both RO and SRO ratings.	Same as above.	Same as above.
2.2.5 Knowledge of the process for making changes in the facility as described in the FSAR.	2.2	3.2	1.6	3.3	SD > 1 for SRO ratings. Comments indicated that this is more an Engineering function than Operations', but operators must be familiar with the process. Reference to the FSAR is unnecessary and confusing.	2.2.5 Knowledge of the process for making design or operating changes to the facility.	Editorial change to increase the relevance of this K/A to Operations and its clarity.
2.2.6 Knowledge of the process for making changes in procedures as described in the safety analysis report.	2.9	3.7	2.3	3.3	Reference to the safety analysis report is unnecessary and confusing.	2.2.6 Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)	Editorial change.
2.2.7 Knowledge of the process for conducting tests or experiments not in FSAR.	2.5	3.4	2	3.2	SD > 1 for SRO ratings. Comments indicated that reference to "experiments" is outdated and has a negative connotation in today's operating environment. Reference to FSAR confusing.	2.2.7 Knowledge of the process for conducting special or infrequent tests.	Editorial change.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.2.8 Knowledge of the process for determining if change/test/experiment involves a USQ.	2.4	3.6	1.8	3.3	SD > 1 for SRO ratings. Comments indicated "USQ" no longer used in the regulation. Operators generally do not make these evaluations without special training.	Delete.	Required knowledge is already addressed in 2.2.5 and 2.2.7.
2.2.9 Knowledge of process to determine if a change/test/experiment increases the probability or consequences of an accident.	2.2	3.3	2	3.3	SD > 1 for SRO ratings. Comments indicated operators generally do not make these evaluations without special training.	Delete.	Required knowledge already addressed in 2.2.5 and 2.2.7.
2.2.10 Knowledge for determining if the margin of safety, as defined in T.S., is reduced by a proposed change/test/experiment.	2.4	3.5	1.9	3.3	SD > 1 for SRO ratings. See comments for 2.2.7 - 2.2.9.	Delete.	Required knowledge already addressed in 2.2.5 and 2.2.7.
2.2.11 Knowledge of the process for controlling temporary changes.	2.7	3.7	2.5	3.4*	Comments indicated that the reference is unclear -- "temporary changes" to what? Procedures? Design?	2.2.11 Knowledge of the process for controlling temporary design changes.	Editorial change to clarify the intended reference.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.2.14 Knowledge of the process for making configuration changes.	3	3.8	2.1	3	Comments asked "configuration changes to what?" and indicated that Engineering would be responsible for initiating such changes.	2.2.14 Knowledge of the process for controlling equipment configuration or status.	Revised to address operators' responsibility, which is to control equipment/plant status, rather than initiate configuration changes.
2.2.15 Ability to identify and utilize as-built design and configuration change documentation to ascertain expected current plant configuration and operate the plant.	2.8	3.3	2.2	2.9	SD > 1 for both RO and SRO ratings. Comments indicated raters could not interpret the intended meaning of the K/A.	2.2.15 Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc. (CFR: 41.10)	Editorial change to improve the interpretability of this K/A and clarify its applicability to the RO and SRO jobs.
2.2.16 Knowledge of the process for making of field changes.	2.4	3	1.9	2.6	SD > 1 for both RO and SRO ratings. Comments indicated that the term, "field changes," is unclear.	Delete.	Outdated K/A. Operators are not involved in making field changes, now an Engineering function.
2.2.17 Knowledge of the process for managing maintenance activities during power operations.	2.7	4	2.3	3.5	Comments indicated that Operations' role in managing at-power maintenance activities has decreased with the addition of Work Planning and Control functions at most plants. However, SROs have oversight responsibilities when authorizing work to proceed.	2.2.17 Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, etc.	Editorial change to add examples of the type of tasks SROs' perform related to at-power maintenance.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.2.18 Knowledge of the process for managing maintenance activities during shutdown operations.	2.8	4	2.3	3.6	Same as above.	2.2.18 Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.	Same as above.
2.2.23 Ability to track limiting conditions for operations.	3.1	4.3	2.6	3.8	Reviewers believe there are many limiting conditions that this K/A could be referencing.	2.2.23 Ability to track Technical Specification limiting conditions for operations.	Added "Technical Specifications" to clarify the intended scope of this ability.
2.2.33 Knowledge of control rod programming.	3.5	3.6	2.5	2.9	SD > 1 for RO rating.	Delete.	Required knowledge already addressed where it applies in Systems section.
2.2.34 Knowledge of the process for determining the internal and external effects on core reactivity.	3.9	4	2.8	3.2*	Comments indicate that, although the wording of this K/A is taken verbatim from a portion of 10 CFR 55, the K/A is unclear without the additional text in the CFR.	2.2.34 Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc. (CFR: 41.10 / 43.6) Move to section 2.1.	Editorial change to clarify the K/A and restore the contextual information from 10 CFR 55.
2.4.6 Knowledge of symptom based EOP mitigation strategies.	3.7	4.4	3.1	4	Comments indicated reference to "symptom-based" EOPs is unnecessary because all EOPs are now symptom-based.	2.4.6 Knowledge of EOP mitigation strategies.	Reference to "symptom-based" EOPs unnecessary.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.4.7 Knowledge of event-based EOP mitigation strategies.	3.5	4.1	3.1	3.8	SRO SD > 1. Comments indicated K/A is confusing because EOPs are not "event-based."	Delete.	Knowledge is addressed in revised 2.4.6.
2.4.8 Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.	3.6	4.2	3	3.7	Comments repeated that EOPs are not event-based.	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	Eliminates reference to "event-based EOPs" for clarity.
2.4.10 Knowledge of annunciator response procedures.	3.9	3.9	3	3.1	Comments indicated there are 100s of these, some of which are important and others aren't.	Delete.	Knowledge addressed in revised 2.4.31 and 2.4.50.
2.4.13 Knowledge of crew roles and responsibilities during EOP flowchart use.	3.4	3.8	3.3	3.9	SD > 1 for both RO and SRO ratings. Comments indicated that variability is the result of few raters being familiar with EOP flowcharts.	2.4.13 Knowledge of crew roles and responsibilities during EOP usage.	Eliminates reference to "flowchart EOPs" to increase the applicability of this K/A to sites that don't use flowcharts.
2.4.14 Knowledge of general guidelines for EOP flowchart use.	3.2	3.9	3	3.9	SD > 1 for both RO and SRO ratings. Same comments as above.	2.4.14 Knowledge of general guidelines for EOP usage.	Same as above.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.4.15 Knowledge of communications procedures associated with EOP implementation.	3.4	3.8	3	3.5	SD > 1 for RO rating. Comments indicated that communication procedures apply under any circumstances in the control room and are not limited to emergency operations.	2.4.15 Move to 2.1, Conduct of Ops, and revise as "Knowledge of the station's requirements for verbal communications when implementing procedures."	There are no special communications requirements for implementing EOPs vs. conducting normal or off-normal operations.
2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity control 2. Core cooling 3. Reactor coolant system integrity and heat removal 4. Containment conditions 5. Radioactivity release control.	4	4.6	3.7	4.3	Reviewers believe the use of "including" in this K/A indicates that an exam question must address all of the listed safety functions.	2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	Editorial change to clarify that the safety functions listed are examples of topics for separate exam questions.
2.4.24 Knowledge of loss of cooling water procedures.	3.9	4.2	3.3	3.7	Comments indicated this K/A is too vague. "What cooling water?"	Delete.	Loss of cooling water events are completely addressed in the Systems and E/APE Sections, where the "type of cooling water" is specified.
2.4.28 Knowledge of procedures relating to emergency response to sabotage.	3.1	4	2.3	3.3	Reviewers noted that operators have broader responsibilities post-9/11.	2.4.28 Knowledge of procedures relating to a security event.	Revised to permit addressing security events in addition to sabotage.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies.	2.6	4.2	2.2	3.6	Comments indicated this K/A is too limited by only referencing outside agencies.	2.4.30 Knowledge of which events related to system operation/status should be reported to internal organizations or external agencies.	Fills a "hole" with respect to internal management notifications and notifications of other groups/departments for both emergency operations and emergency plan implementation.
2.4.31 Knowledge of annunciators alarms and indications, and use of the response instructions.	4.1	4	3.3	3.4	Commenters noted this K/A is redundant with 2.4.10. Delete 2.4.10 and revise this one.	2.4.31 Knowledge of annunciator alarms, indications, or response procedures.	Eliminated "use of response instructions" portion because it is addressed in 2.4.50.
2.4.34 Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.	4.1	4	3.8	3.6	Commenters didn't understand "system geography and system implications."	2.4.34 Knowled ge of RO tasks performed outside the main control room during an emergency and the resultant operational effects. (CFR 41.10 / 43.5 / 45.13)	Revised to clarify intended meaning of the K/A.
2.4.35 Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.	3.6	3.8	3.3	3.5	Same as above.	2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	Same as above.
2.4.36 Knowledge of chemistry / health physics tasks during emergency operations.	2.4	3	2	2.8	Commenters indicated that these tasks are proceduralized in the EOPs.	Delete.	Operators are not trained in HP/Chemistry tasks. Requirements for interactions between Ops and HP/Chemistry are clearly defined in Emergency Procedures and Emergency Plan.

Table 1: K/As Recommended for Revision or Deletion

	Survey Ratings		Catalog Ratings				
2.4.37 Knowledge of the lines of authority during an emergency.	3.2	4.1	2	3.5	SD for RO job > 1. Commenters were unclear as to whether this K/A refers to EOPs or the emergency plan.	2.4.37 Knowledge of the lines of authority during implementation of the emergency plan.	Revised to clarify intended meaning of the K/A.

Table 2: K/As Recommended for Relocation to Another Sub-section within Section 2

Current K/As	Survey Ratings		Catalog Ratings		Problem	Suggested Revision	Rationale for Change
	RO	SRO	RO	SRO			
2.2.26 Knowledge of refueling administrative requirements.	2.8	3.9	2.5	3.7	Fuel-handling is listed as a Conduct of Ops topic in NUREG-1021.	Move to section 2.1	Editorial change for consistency with NUREG-1021.
2.2.27 Knowledge of the refueling process.	2.8	3.7	2.6	3.5	Same as above.	Move to section 2.1	Same as above.
2.2.28 Knowledge of new and spent fuel movement procedures.	2.5	3.4	2.6	3.5	Same as above.	Move to section 2.1	Same as above.
2.2.29 Knowledge of SRO fuel handling responsibilities.	2	4.1	1.6	3.8	Same as above.	2.2.29 Knowledge of the fuel-handling responsibilities of SROs. Move to section 2.1	Editorial change. Rationale for moving to Section 2.1 same as above.
2.2.30 Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel systems operated from the control room in support of fueling operations, and storage facility, supporting	3.9	3.8	3.5	3.3	Same as above.	Move to section 2.1	Same as above.

Table 2: K/As Recommended for Relocation to Another Sub-section within Section 2

	Survey Ratings		Catalog Ratings				
instrumentation.							
2.2.31 Knowledge of procedures and limitations involved in initial core loading.	2.5	3.2	2.2	2.9	SD > 1 for both RO and SRO ratings. Comments indicated that limiting the knowledge to initial core loading makes this irrelevant until new plants are built.	2.2.31 Knowledge of procedures and limitations involved in core alterations. Move to section 2.1	Revised to increase the scope of the K/A to apply to both initial core loading and any core alterations. Move for same reasons as above.
2.2.32 Knowledge of the effects of alterations on core configuration.	3	3.6	2.3	3.3	Becomes redundant, if the recommended revision to 2.2.31 is implemented.	Delete, or move to section 2.1 if retained.	Proposed revision of 2.2.31 addresses CFR requirements.
2.1.10 Knowledge of conditions and limitations in the facility license.	3.6	4.5	2.7	3.9	Several LCO-related K/As are in 2.1 and some are in 2.2. LCOs are based on equipment status, less relevant to Conduct of Ops. Grouping these K/As in one section avoids double-dipping LCO topics in 2 different sections.	Move to section 2.2.	In order to group LCO-related K/As in relevant section.
2.1.11 Knowledge of less than one hour technical specification action statements for systems. (CFR: 43.2 / 45.13)	3.9	4.5	3	3.8	Same as above.	Move to section 2.2.	Same as above.

Table 2: K/As Recommended for Relocation to Another Sub-section within Section 2

	Survey Ratings		Catalog Ratings				
2.1.12 Ability to apply technical specifications for a system.	3.4	4.7	2.9	4	Same as above.	Revise to capitalize "Technical Specifications" for consistency. Move to section 2.2.	Same as above.
2.1.33 Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.4	4.7	3.4	4	Same as above.	2.1.33 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. Move to section 2.2.	Same as above and editorial change.
2.1.22 Ability to determine Mode of Operation.	3.75	4.1	2.8	4.2	SD > 1 for RO job. Comments indicate raters unclear about what specific ability is required here.	2.1.22 Ability to determine Technical Specification Mode of Operation. Move to Section 2.2 as revised.	Editorial change to clarify that the ability relates to Tech Specs. Move to 2.2 for reasons described above.
2.1.24 Ability to obtain and interpret station electrical and mechanical drawings.	3.5	3.9	2.8	3.1	The reviewers determined that this ability is necessary for equipment control, rather than conduct of ops.	Move to section 2.2.	More closely related to issues of equipment control.
2.4.15 Knowledge of communications procedures associated with EOP implementation.	3.4	3.8	3	3.5	SD > 1 for RO rating. Comments indicated that communication procedures apply under any circumstances in the control room and are	2.4.15 Knowledge of the station's requirements for verbal communications when implementing procedures. Move to 2.1.	There are no special communications requirements for implementing EOPs vs. conducting normal or off-normal operations.

Table 2: K/As Recommended for Relocation to Another Sub-section within Section 2

	Survey Ratings		Catalog Ratings				
					not limited to emergency operations.		
2.4.33 Knowledge of the process used track inoperable alarms.	3	3.3	2.4	2.8	Reviewers believe that the applicability of this K/A should not be limited only to emergency or off-normal operations.	Add "to" before "track." Move to section 2.2.	More relevant to equipment control than to emergency operations.
2.4.48 Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	4.2	4.4	3.5	3.8	Same as above.	Add "a" before "system." Move to section 2.2.	Same as above. Editorial change.

Table 3: Recommendations for New K/A and Replacements for Sub-Section 2.3

Current K/As	Survey Ratings		Catalog Ratings		Problem	Suggested Revision	Rationale for Change
	RO	SRO	RO	SRO			
	TBD	TBD			N/A	Add to Section 2.1: Knowledge of procedures, guidelines, or limitations associated with reactivity management. (CFR: 41.10 / 43.6).	"Reactivity management" is a new and important topic in operator training since Rev.s 0 and 2 were published.
2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements	3	3.5	2.6	3	The survey responses indicated several significant problems with the K/As in sub-section 2.3, "Radiation Protection." The problems include (1) overall, the K/As are rated as lower in importance; (2) K/As with SDs > 1; (3) the commenters indicted that some of the K/As are "too	See below for suggested new K/As to replace these.	To address the current weaknesses in subsection 2.3.
2.3.2 Knowledge of facility ALARA program.	3.1	3.2	2.5	2.9			
2.3.3 Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g. waste disposal and handling	2.2	3	1.8	2.9			

Table 3: Recommendations for New K/A and Replacements for Sub-Section 2.3

	Survey Ratings		Catalog Ratings				
system).					basic" for testing in a licensing exam; (4) some K/As are irrelevant to the operator's job; and (5) some K/As are difficult to interpret.		
2.3.4 Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.2	3.7	2.5	3.1			
2.3.5 Knowledge of use and function of personnel monitoring equipment.	2.9	2.9	2.3	2.5			
2.3.6 Knowledge of the requirements for reviewing and approving release permits.	3.3	3.5	2.1	3.1			
See above.	TBD.		N/A.		See above.	2.3.1 Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc. (CFR: 41.12)	See above.

				2.3.2 Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc. (CFR: 41.12)	
				2.3.3 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. [CFR: 43(b)(4)]	
				2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. [CFR: 41(b)(12) / 45(a)(10]	

				2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 45.9)	
				2.3.6 Ability to approve release permits. (CFR: 43.4 / 45.10)	
				2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions. (CFR: 41.12 / 45.10)	
	TBD.			2.3.8 Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 45.9)	
				2.3.9 Ability to control radiation releases. (CFR: 43.4 / 45.10)	

Table 4: Recommendations for New K/A for re-rating

Current K/As	Survey Ratings		Catalog Ratings		Problem	Suggested Revision	Rationale for Change
	RO	SRO	RO	SRO			
	TBD	TBD			N/A	TBD: Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.	
						TBD: Ability to analyze the effect of maintenance activities (such as degraded power sources) on the status of limiting conditions for operations.	
						TBD: Knowledge of which events related to system operation/status should be reported to internal organizations or external agencies (e.g, the state, the NRC, or the transmission system operator).	

ATTACHMENT 3
SECOND SURVEY REPORT & RECOMMENDATIONS

PROJECT TO UPDATE SECTION 2, "GENERIC KNOWLEDGES AND ABILITIES," OF NUREG-1122 AND NUREG-1123: SUMMARY OF SECOND VALIDATION SURVEY RESULTS

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ABSTRACT

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry examiner personnel have described them as the greatest source of confusion in NUREG-1122 (the Catalog) and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements. The results of the survey, which included participants only from PWRs, indicated that it would be worthwhile to update Section 2. Therefore, the WOG TWG held a workshop in May 2005 and revised selected K/As using the information collected from the survey. Discussions were held with the NRC regarding the NRC's interest and ability to support revising Section 2 of the Catalog. The NRC staff determined that it would be worthwhile to complete the project by conducting a second survey to obtain importance ratings for the new and revised K/As proposed by the WOG TWG. The Boiling Water Reactor Owners' Group, the Institute for Nuclear Power Operations, and the Nuclear Energy Institute also endorsed continuing this project. At the NRC's request, additional K/As were generated for Section 2 and 33 K/As related to degraded voltage to be added to the E/APEs in Section 4 of the Catalog were included in the second survey for importance ratings. Operations personnel from BWRs participated in the second survey. This report summarizes the methods and findings of the second survey and offers recommendations for next steps to complete the project.

EXECUTIVE SUMMARY

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project (PA-OSC-139) to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) listed in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The results of the survey indicated that it would be worthwhile to update Section 2 of the Catalog to (1) improve the interpretability of several confusing K/As; (2) increase the number of K/As in Section 2 that are applicable to the reactor operator (RO) job position; and (3) enhance the difficulty and applicability of the K/As in Subsection 2.3, Radiation Protection, to licensed duties. Therefore, the WOG TWG developed a set of new and revised K/As to replace the K/As in Section 2 that the survey had shown were problematic and planned to conduct a second survey to obtain "importance to safety" ratings for the new and revised K/As. In addition, the NRC staff requested the WOG TWG to include 33 additional K/As in the second survey to obtain importance ratings for them. These K/As would be added to the E/APEs in Section 4 of the Catalog and pertain to degraded voltage situations.

The second survey was administered over the World Wide Web between April 3, 2006 and June 5, 2006. One hundred and seventy-one participants completed the survey. Twenty-three sites with operating PWRs and twenty sites with operating BWRs provided respondents for the survey. The utility volunteers who participated in the survey (1) held a PWR or BWR license as a Reactor Operator (RO) or Senior Reactor Operator (SRO) at the time of the survey or previously held a PWR or BWR license, (2) had access to the internet, and (3) had available approximately 45 minutes of time to complete the survey. Ten NRC examiners also participated.

Ratings provided by different groups of participants were analyzed for evidence of systematic differences, including comparisons between BWR and PWR respondents; NRC examiners and utility respondents; licensed RO and SRO respondents; licensed and non-licensed respondents; years spent as a RO; type of SRO license; time spent standing watch; those who have developed a licensing exam and those who have not; and training personnel, and operations management personnel. No systematic differences were found in the importance ratings provided by different groups of participants.

Additional analyses of the survey data led to the following conclusions:

- Overall, the results of this second survey demonstrated that the large majority of the revised and new K/As are acceptable for inclusion in a revision to NUREG-1122 and NUREG-1123. The majority of importance ratings

obtained for the revised and new K/As exceeded 2.5 with little undesirable variability in the participants' importance ratings;

- Four K/As had average importance ratings under 2.5 for the RO job, which is acceptable because each of these K/As was revised to address SRO job responsibilities. Overall, replacing the current K/As with the new and revised K/As for Section 2 would increase the number of K/As that are appropriate for inclusion in an RO-level licensing exam;
- The importance ratings and consistency of the ratings obtained for the proposed new K/As for Subsection 2.3, Radiation Protection, were higher than those obtained in the first survey for the Subsection 2.3 K/As. The importance ratings for the new K/As were also substantially higher than those in the current Catalogs. These results suggest that replacing the current K/As in this subsection is appropriate;
- Eleven importance ratings distributed among eight of the new and revised K/As showed substantial variability among the raters, indicating that these K/As may require additional updating or clarification (five of the ratings were from the new or revised K/As for Section 2, six were from the proposed Section 4 K/As);
- Participant responses to which of several types of exams should include questions for K/A 50, "Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.," resulted in 54% of respondents choosing the General Fundamental Exam as the appropriate examination to include questions related to this K/A. These findings indicate that it is inappropriate to include this K/A in Section 2;
- Participant responses to which of several types of exams should include questions for K/A 51, "Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.," resulted in 37% of respondents choosing the SRO site-specific exam, 24% choosing the RO site-specific exam, and 30% choosing General Fundamental Exam.

Based on these findings a revised Section 2, incorporating the results from the first and second surveys conducted for this project, will be submitted to the NRC for consideration as a replacement for the current Section 2 in the K/A Catalogs.

CONTENTS

ABSTRACT 2
EXECUTIVE SUMMARY 3
CONTENTS 5
1: INTRODUCTION 6
1.1 Purpose and Scope 6
1.2 Background 6
1.3 Development of New and Revised K/As 8
2 METHODS 9
2.1 Respondents 9
2.2 Survey Administration 9
2.3 Survey Instrument 9
3 ANALYSIS AND RESULTS 11
3.1 Respondent Characteristics 11
3.2 Comparisons between Respondent Groups 18
3.3 Importance to Safety Ratings 24
3.3.1 Variability in the Importance Ratings 25
3.4 Testing the K/As on RO and SRO Licensing Examinations 31
3.5 Summary of Survey Results 32
4 STEPS TO PROJECT COMPLETION 33
4.1 Recommended Steps 33
ATTACHMENT 1: Second Validation Survey K/As 36
ATTACHMENT 2: Instructions to Survey Participants 41
ATTACHMENT 3: Importance Ratings, Standard Deviations, and Recommendations for New and Revised K/As 44
ATTACHMENT 4: K/As with Standard Deviations Greater Than One with Comments from Participants 74
ATTACHMENT 5: Comments from Participants for all K/As 79
ATTACHMENT 6: Which Exam Should Include Question: Comments 108
ATTACHMENT 7: First Survey Results – Importance to Safety ratings 108

1: INTRODUCTION

1.1 Purpose and Scope

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry examiner personnel have described them as the greatest source of confusion in NUREG-1122 (the Catalog) and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements. The results of the survey, which included participants only from PWRs, indicated that it would be worthwhile to update Section 2. Therefore, the WOG TWG held a workshop in May 2005 and revised selected K/As using the information collected from the survey. Discussions were held with the NRC regarding the NRC's interest and ability to support revising Section 2 of the Catalog. The NRC staff determined that it would be worthwhile to complete the project by conducting a second survey to obtain importance ratings for the new and revised K/As proposed by the WOG TWG. The Boiling Water Reactor Owners' Group (BWROG), the Institute for Nuclear Power Operations, and the Nuclear Energy Institute also endorsed continuing this project. At the NRC's request, additional K/As were generated for Section 2 and 33 K/As related to degraded voltage to be added to the E/APEs in Section 4 of the Catalog were included in the second survey for importance ratings. Operations personnel from BWRs participated in the second survey. This report summarizes the methods and findings of the second survey and offers recommendations for next steps to complete the project.

1.2 Background

NUREG-1122 and NUREG-1123 (the Catalogs) were initially developed in 1985 by a working group comprised of licensed Reactor Operators (ROs), Senior Reactor Operators (SROs), and NRC-certified operator licensing examiners. The original Catalogs were developed using the Institute of Nuclear Power Operations' (INPO) generic Job and Task Analysis (JTA). INPO developed the generic JTA in an effort to provide a common starting point for member utilities to develop their site-specific JTAs. The NRC impaneled industry job incumbents (ROs and SROs), augmented by NRC-certified licensing examiners, to develop the K/As using a consensus process and to rate the "importance to safety" of each K/A.

In 1996, the NRC updated the Catalogs and made extensive changes to Section 2. These changes included: (1) moving many of the previous system generic K/As

into Section 2 and revising them for plant-wide applicability; (2) reorganizing Section 2 into four subsections and establishing sampling requirements for the four subsections; (3) linking the K/As to the applicable 10 CFR 55 requirements; and (4) adding new plant-wide generic K/As. The NRC obtained new "importance to safety" ratings for the new and revised K/As, but retained the importance ratings from Rev. 0 of the Catalogs for the K/As that were not changed.

The industry has continued to accumulate operating experience and "lessons learned" over the past 20 years, as well as during the past 10 years since Rev.s 2 to NUREG-1122 and NUREG-1123 were published. Therefore, one purpose of this project is to update the "importance to safety" ratings in the current Catalogs, as well as determine whether there are new K/As that should be added.

In addition, since the Catalogs were last revised, the NRC has changed its regulations and now permits its licensees to develop operator licensing examinations, rather than restricting exam development to NRC-certified licensing examiners. In order to ensure consistency in the exam development process when implemented by the utilities, the NRC also revised NUREG-1021, *Operator Licensing Examiner Standards for Power Reactors*. The revised examiner standards decrease the latitude given to exam developers in choosing the K/As to be tested in an exam and require test items to be more closely aligned with the content of the K/As. However, it has been the experience of the WOG TWG members that some of the K/As in Section 2 are difficult to interpret, some are outdated, and some are inappropriate for licensing examinations. Therefore, it is difficult to develop written exam questions based on these K/As that are acceptable to NRC reviewers. As a result, both utility and NRC resources are wasted in the rework required to develop acceptable exams.

The Westinghouse Owners' Group (WOG) Training Working Group (TWG) initiated a project to survey licensed operators in the commercial nuclear power industry to reassess the job relevance and "importance to safety" of the 129 knowledges and abilities (K/As) in Section 2, "Generic Knowledges and Abilities," of NUREG-1122 (*Knowledges and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors, Rev. 2*). The K/As in Section 2 were selected for review because industry examiner personnel have described them as the greatest source of confusion in NUREG-1122 (the Catalog) and the most significant mismatch between the member utilities' expectations and the NRC's testing requirements.

A survey was administered and 129 participants completed the survey. The results of the initial survey indicated that –

- The importance ratings for 22% of the current K/As in Section 2 showed substantial variability among the raters, indicating that these K/As should be updated or clarified;

- There are many more K/As in Section 2 that are appropriate for testing in an SRO-level exam than in an RO-level exam, indicating that exam developers may have difficulties in selecting the required number of K/As from Section 2 to be tested in initial licensing exams;
- The knowledge or ability required is different for the RO and SRO jobs in 45% of the K/As, indicating that revisions to the K/As may be warranted to clarify their unique applicability to the two job levels; and
- The K/As in Subsection 2.3, Radiation Protection, appear to be particularly difficult to interpret and use as the basis for exam questions that are applicable to licensed operators' job requirements.

These results indicated that it would be worthwhile to update Section 2. Therefore, the WOG TWG held a workshop to review the information collected from the survey and develop recommendations for adding, deleting, and revising the K/As to increase their relevance to today's operating environment. Results of the Importance to Safety Ratings from the first survey are shown in Attachment 7.

1.3 Development of New and Revised K/As

Proposed revisions to Section 2 were developed in several steps. First, a subgroup of WOG TWG members who have been assigned to monitor the progress of this project were divided at random into two approximately equal working groups and assigned specific K/As to review. Over the first 1.5 days of the workshop, the two groups reviewed the information provided and developed proposed revisions to the K/As. Additional reference materials used by the groups included Chapter 10 of the Code of Federal Regulations, Rev.s 0 and 2 of NUREG-1122, and Rev. 9 of NUREG-1021. An NRC representative was also present and participated as a member of one of the working groups.

On the afternoon of the second day of the workshop, the results from the two working groups were presented to all WOG TWG members who attended the meeting for additional review, revision, and concurrence. The WOG TWG members present also reviewed the survey respondents' recommendations for new K/As. Finally, the WOG TWG reviewed all of the comments provided by the survey respondents on all of the K/As to determine whether other K/As could be improved.

A report was developed in August 2005 that summarized the survey results and recommendations for revising and adding K/As to Section 2, after a second survey was completed to obtain importance ratings for the proposed revised and new K/As. A meeting was held with the NRC in Rockville, Maryland in October 2005 to present the findings of the survey. The NRC indicated that they did not believe that the proposed changes were of sufficient significance to warrant a revision to the Catalog at that time. A subsequent meeting was held in January 2006 with the NRC to further address their concerns and answer questions. In the interim, the Boiling Water Reactor (BWR) Owners' Group (BWROG) committed

to this project, endorsing an update to Section 2 of NUREG-1123, and participated in the January 2006 meeting. During the January 2006 meeting, the NRC requested some new K/As to be included in the second survey and also requested that 33 K/As related to degraded voltage be added to the survey and evaluated for possible inclusion in Section 4 of the Catalog. A final teleconference was conducted on February 16, 2006, in which the NRC gave concurrence for the second validation survey and continuation of the project. The 87 K/As that were rated in the second validation survey are listed in Attachment 1.

2 METHODS

2.1 Respondents

All participants from the first survey were sent a request to participate in this second survey. In addition, the BWROG sent out a request asking for volunteers to participate in the survey who (1) currently hold or previously held a BWR license, (2) had access to the internet to complete the survey, and (3) had available approximately 45 minutes of time to complete the survey

2.2 Survey Administration

The survey was administered electronically via the World Wide Web in order to (1) permit respondents to complete the survey at their own pace, (2) reduce administration time and data input costs, and (3) maintain control over access to the survey and results. The survey administrators contacted each volunteer and provided him or her with a unique user name and password for accessing the survey website. Only the survey administrators were able to link responses to the individual participants. Responses were collected between April 3, 2006 and June 5, 2006.

2.3 Survey Instrument

The instructions for completing the survey, which were provided to the participants when they logged into the survey website, can be seen in Attachment 2.

The initial survey questions requested information about each respondent, including:

- The reactor design (BWR vs. PWR) for which they hold a currently active license or for which they were previously licensed;

- The NSSS vendor type of the PWR unit(s) for which they are licensed (or, in the case of those who are not currently licensed, the NSSS vendor types with which they are most familiar);
- The type of BWR unit for which they are licensed (or, in the case of those who are not currently licensed, the type with which they are most familiar);
- Whether they were licensed at the time of completing the survey and, if so, the type of license held (i.e., RO or SRO);
- The number of years they held an RO and/or SRO license;
- Their job duties at the time of completing the survey;
- The amount of time they had spent standing watch, on shift, in the past 5 years; and
- Whether they had ever developed or reviewed an operator licensing exam.

The respondents were then asked to answer two questions for each of the 87 K/As. For each K/A, respondents were asked the following questions:

- In your opinion, how important is it for ROs to master this K/A in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);
- In your opinion, how important is it for SROs to master this K/A in ensuring safe plant operations? (Response options were the 1-5 rating scale used for previous importance ratings with 1 = insignificant importance; 2 = of limited importance; 3 = fairly important; 4 = very important; and 5 = essential);

For two K/As (K/A 50, "Knowledge of site corrosion processes, such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc." and K/A 51, "Knowledge of water chemistry controls, such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc."), respondents were also asked to answer:

- In your opinion, which of the following exams should include questions that test for mastery of this K/A? (Response options were the site-specific RO licensing exam; site-specific SRO licensing exam; General Fundamentals Exam; Other exams such as GET or Radworker training; and don't know).

Text fields were also provided for respondents to offer explanatory comments for their responses or additional information.

3 ANALYSIS AND RESULTS

3.1 Respondent Characteristics

One hundred and seventy-one respondents completed the entire survey. Except for the data analyses that required complete data from each participant (i.e., comparisons between respondent groups), all of the responses from each participant were included in the analyses.

Twenty-three sites with operating PWRs provided 101 respondents for the survey and 20 sites with operating BWRs provided 59 respondents. Tables 1 and 2 show the number of respondents from each site and their distribution among utilities.

Table 1: PWR Participating Sites N=101 Respondents

Beaver Valley (FENOC)	11	McGuire (Duke)	8
Braidwood (Exelon)	4	Oconee (Duke)	6
Callaway (Ameren)	2	Palisades (NMC)	3
Catawba (Duke)	3	Palo Verde (Pinnacle)	3
Comanche Peak (TXU)	1	Prairie Island (NMC)	2
Cook (American Electric)	3	Salem (PSEG/Exelon)	3
Diablo Canyon (PG&E)	5	Sequoyah (TVA)	1
Farley (Southern Nuclear)	1	South Texas (STP)	14
Ginna (Constellation)	4	VC Summer (SCANA)	4
Harris (Progress Energy)	2	Vogtle (Southern Nuclear)	4
Kewaunee (NMC)	2	Waterford (Entergy)	1
		Wolf Creek (Wolf Creek)	14

5

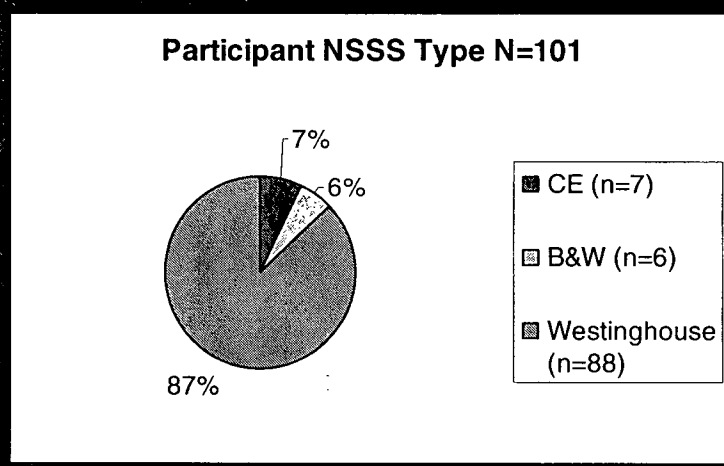
Table 2: BWR Participating Sites N=59 Respondents

Browns Ferry (TVA)	6	LaSalle (Exelon)	2
Brunswick (Progress)	3	Limerick (Exelon)	3
Clinton (AmerGen)	3	Nine Mile (Constellation)	3
Columbia (Energy NW)	2	Oyster Creek (Entergy)	3
DAEC (FPL)	3	Peach Bottom (Exelon)	3
Dresden (Exelon)	3	Perry (First Energy)	3
Fermi (DTE)	4	Pilgrim (Entergy)	1
Grand Gulf (Entergy)	2	River Bend (Entergy)	3
Hatch (Southern)	6	Susquehanna (PPL)	2
Hope Creek (PSE&G)	1		

4

Of the 101 PWR respondents, seven represented CE plants, six represented Babcock and Wilcox plants, and 88 represented Westinghouse plants. The majority of the 59 BWR participants represented GE BWR-4 models (n=32), three participants represented GE BWR-2 models, seven represented GE BWR-3 models, six represented BWR-5 models, and 11 represented GE BWR-6 models. The distributions of respondents among the NSSS vendor types are shown in Figures 1 and 2.

Figure 1: NSSS Vendor Types



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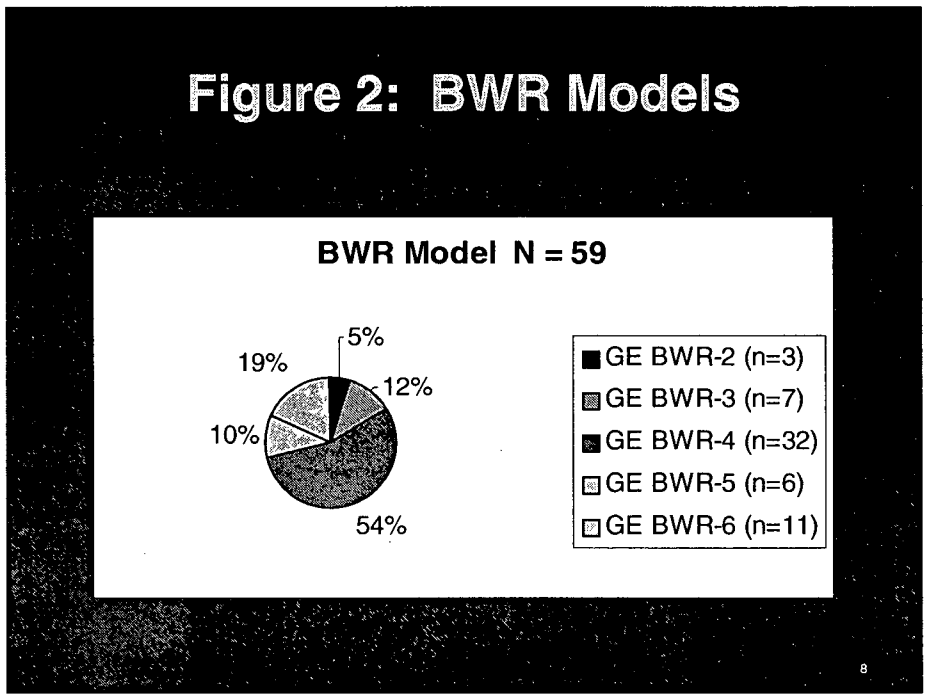


Figure 3 shows the license status of the participants at the time they responded to the survey. Forty-two percent of respondents held an active SRO license, 33% of the respondents were not licensed, and 25% held an RO license at the time of the survey. The respondents were similar in licensed status to those who participated in the first survey. At the time of the first survey 44% of those respondents held an active SRO license, 26% were not licensed, and 30% held an RO license.

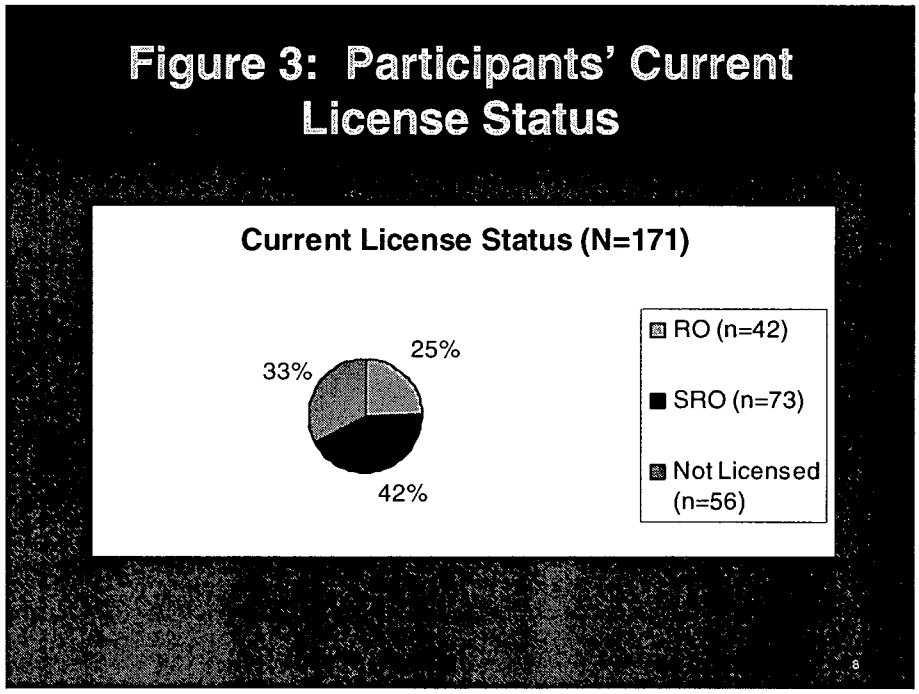
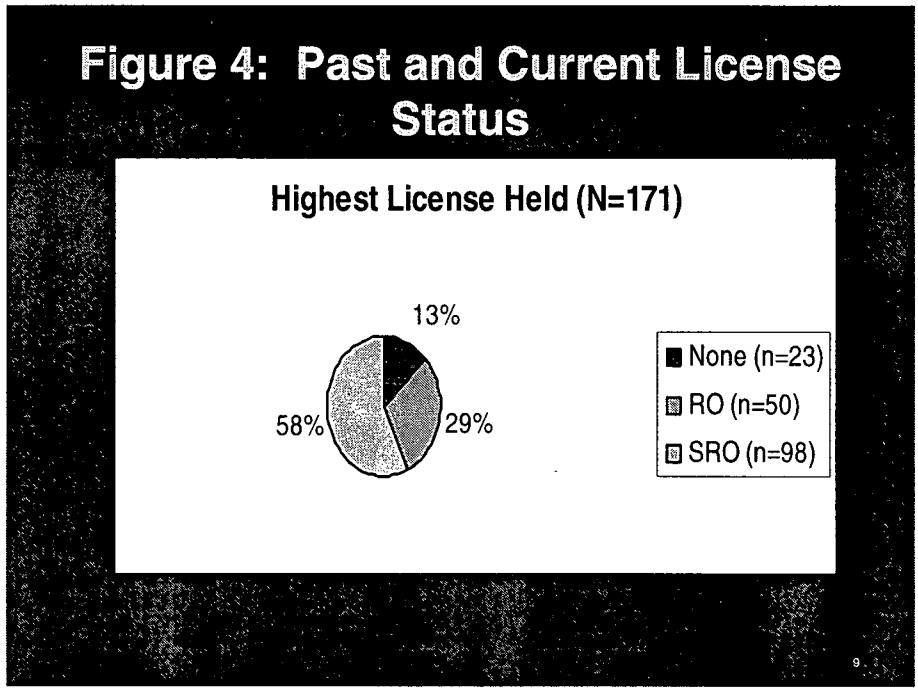
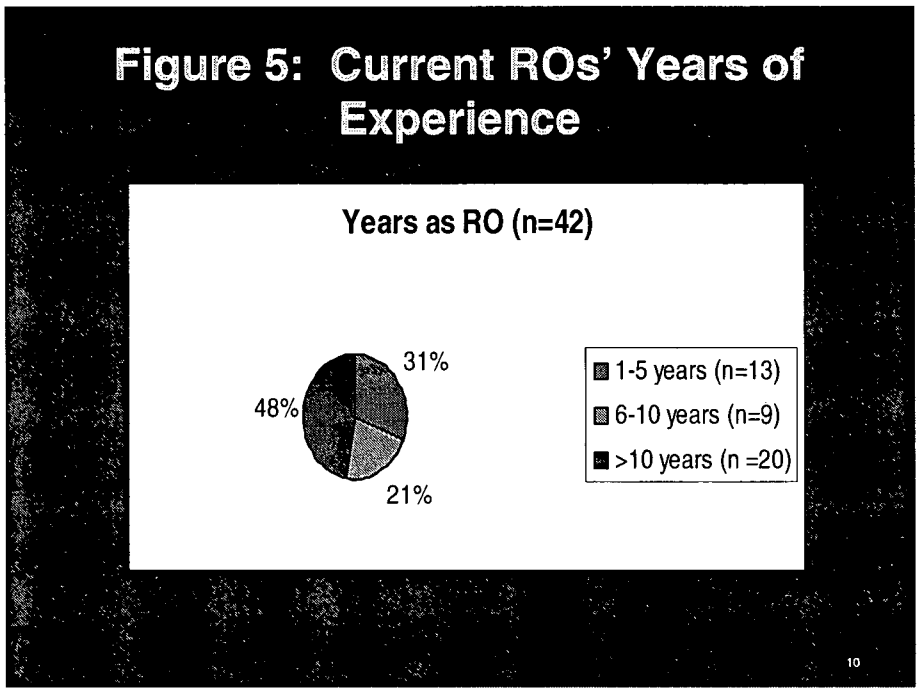


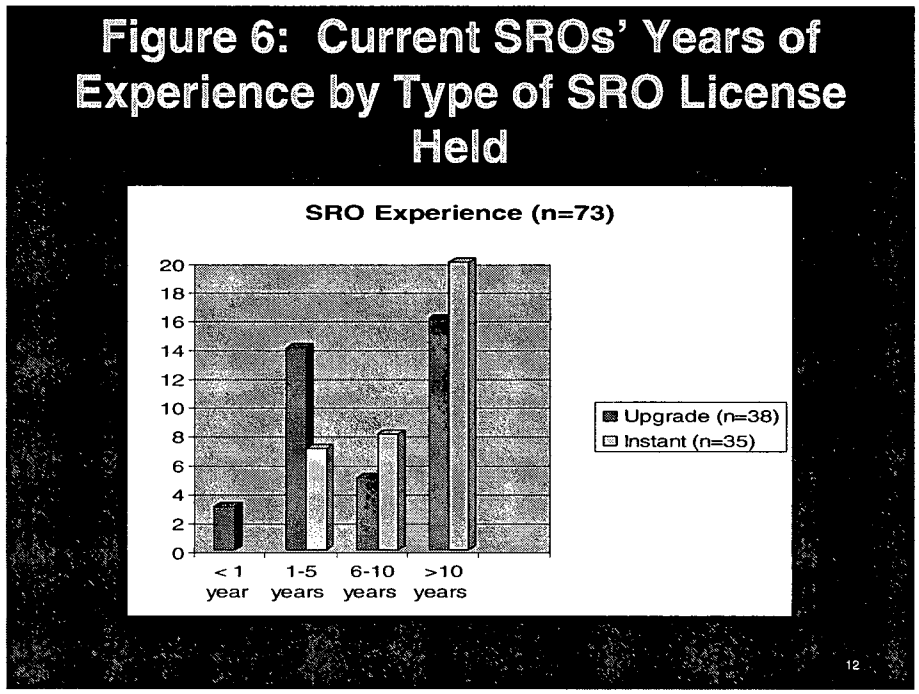
Figure 4 shows that at the time of the survey the majority of respondents (58%) currently held or previously held an SRO license. This percentage of SRO licenses is similar to the license histories of the respondents in the first survey (57% SRO, 35% RO, 8% none).



In general, the respondents had many years of experience in operations. Figure 5 shows that, among the respondents who held an RO license, the majority (69%) had been licensed for more than 5 years. This percentage is higher than the percentage of respondents who had been licensed more than 5 years in the first survey (59%), but the difference in these percentages was not statistically significant.

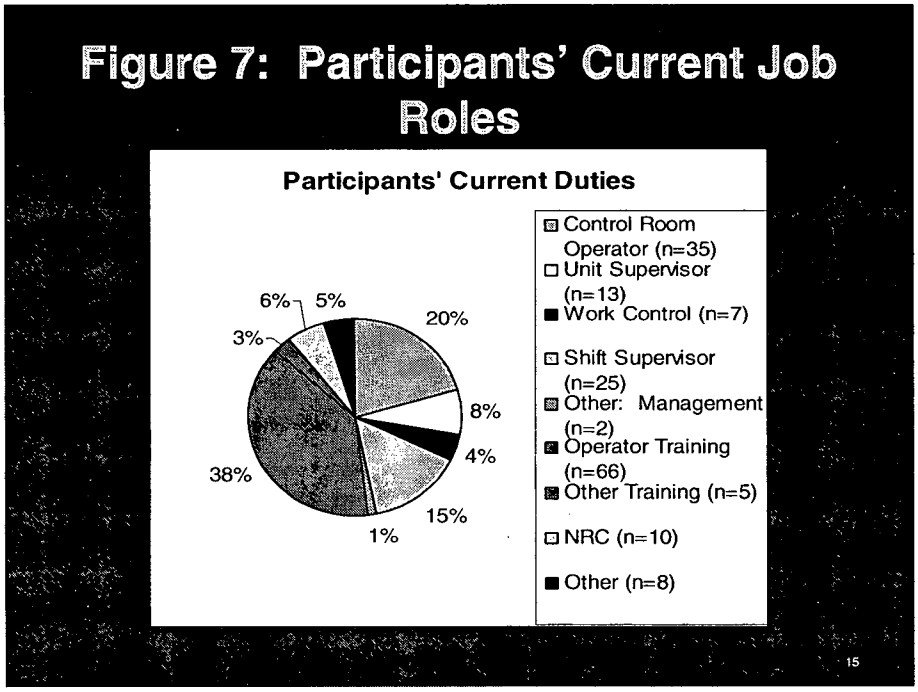


As was found among respondents in the first survey, the majority of respondents in the second survey who were licensed as either an "upgrade" or "instant" SRO at the time of the survey had also been licensed for more than 5 years, as shown in Figure 6.

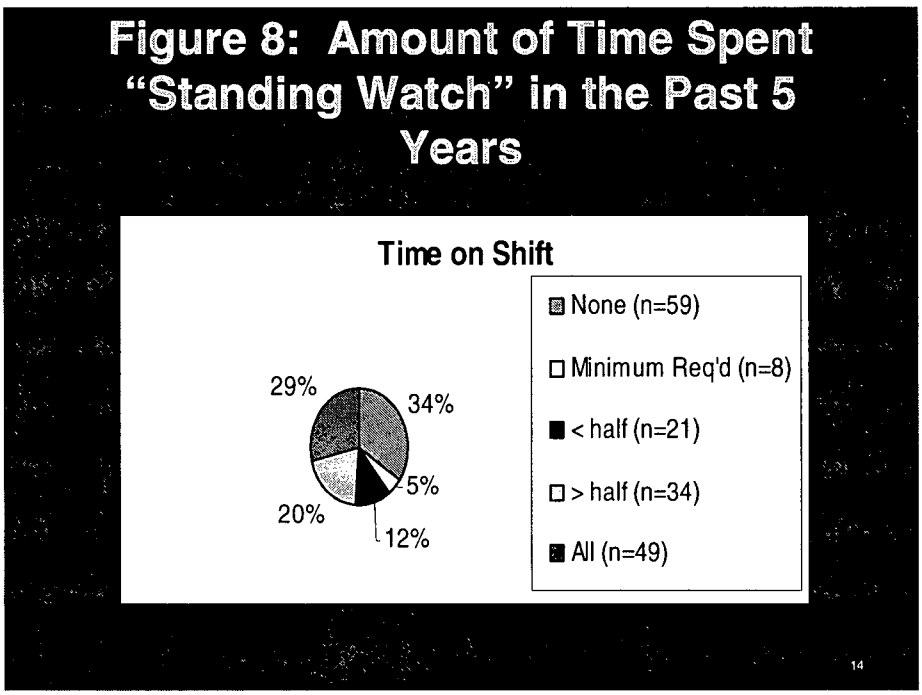


The majority of the respondents also indicated that they had some familiarity or experience with the exam development process. One hundred twenty-two of the 171 respondents (71%) indicated that they had developed or reviewed a licensing exam. In the first survey, 57% of the respondents had developed or reviewed a licensing exam. The difference in these percentages was analyzed and results indicated that the difference is not statistically significant.

Figure 7 shows the respondents' primary job duties at the time of the survey. The largest single group of respondents (38%) was involved in developing, delivering, or managing operations training compared to 30% of the respondents in the first survey. The number of participants currently engaged in actually performing operations duties on shift, when combining control room operators, shift supervisors, and unit supervisors, represents 42% of the respondents to second survey, compared to 58% of the respondents to the first survey. The differences in these percentages between the respondents to the first and second surveys were not statistically significant.



Almost half of the respondents (49%) had spent more than half of their time actually standing watch in the past 5 years, as shown in Figure 8. This proportion of respondents was not statistically different from the proportion of respondents in this group in the first survey (57%).



Overall, the sample of respondents appeared to represent a reasonable cross section of –

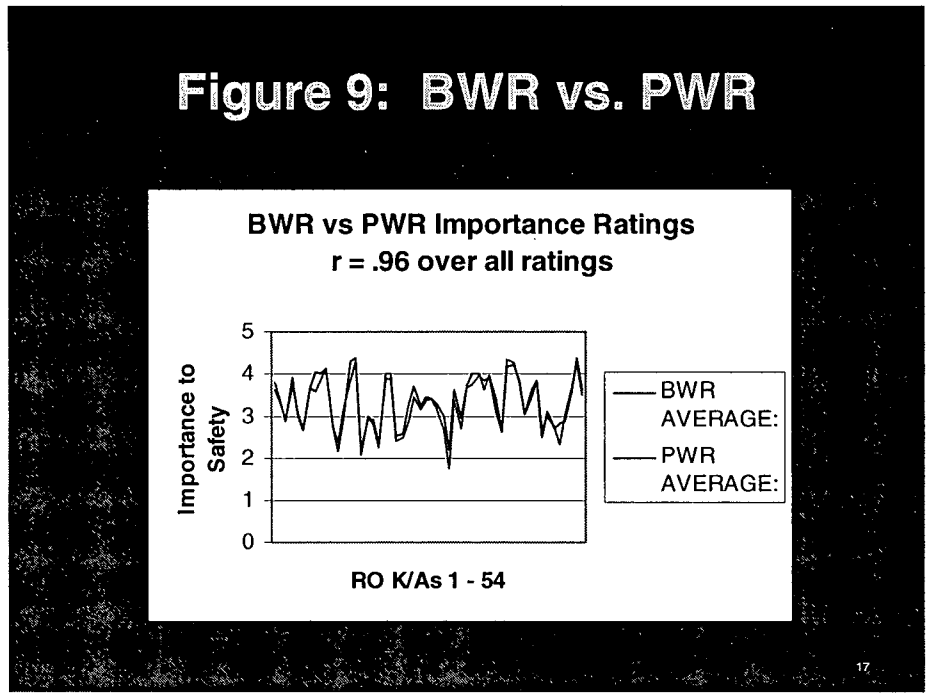
- Utilities and sites;
- Individuals who had current knowledge of BWR and PWR operations at the time of the survey; and
- Individuals who were knowledgeable of the licensing exam process.

In addition, the comparisons between the respondents to the first and second surveys indicated that the composition of the two respondent groups was similar. Therefore, if Section 2 of the Catalogs will be revised, it would be appropriate (i.e., methodologically defensible) to use the importance ratings obtained in the first survey for the K/As in Section 2 that were not revised.

3.2 Comparisons between Respondent Groups

A number of analyses were conducted to determine whether there were systematic differences in the importance ratings provided by different groups of respondents in the second survey. In each case, no statistically significant pattern of differences was found in the ratings provided by the different groups that were compared.

The importance ratings provided by participants from BWR plants were compared to those given by participants from PWR plants across the set of K/As. Figure 9 illustrates the similarity of the importance ratings from these two groups ($r = 0.96$).



Importance ratings given by NRC examiners were compared to importance ratings provided by industry representatives, as shown in Figure 10 (r = 0.93). The ratings provided by these two groups were also consistent.

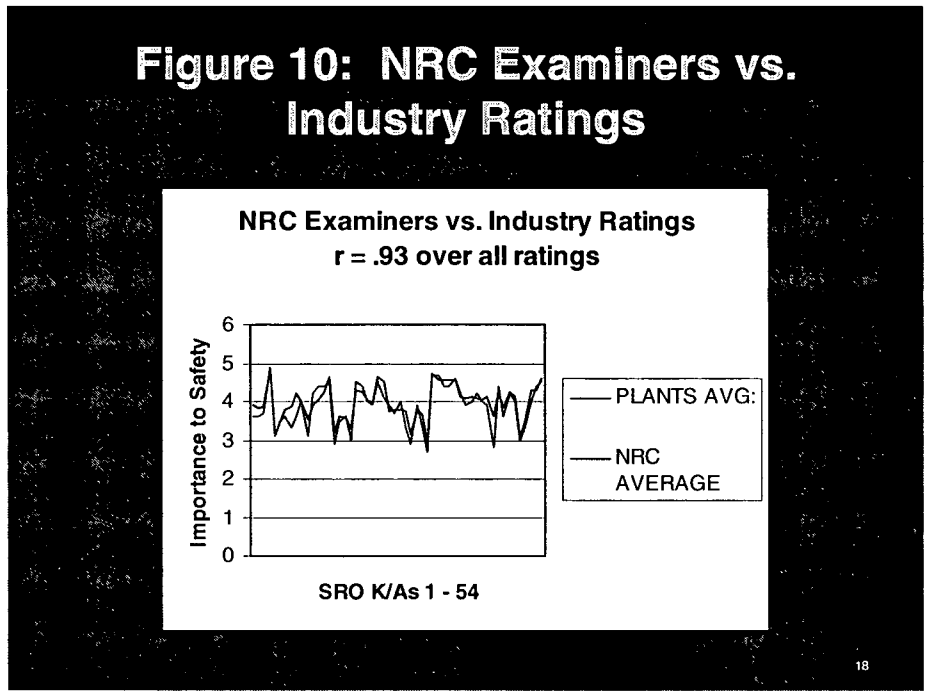
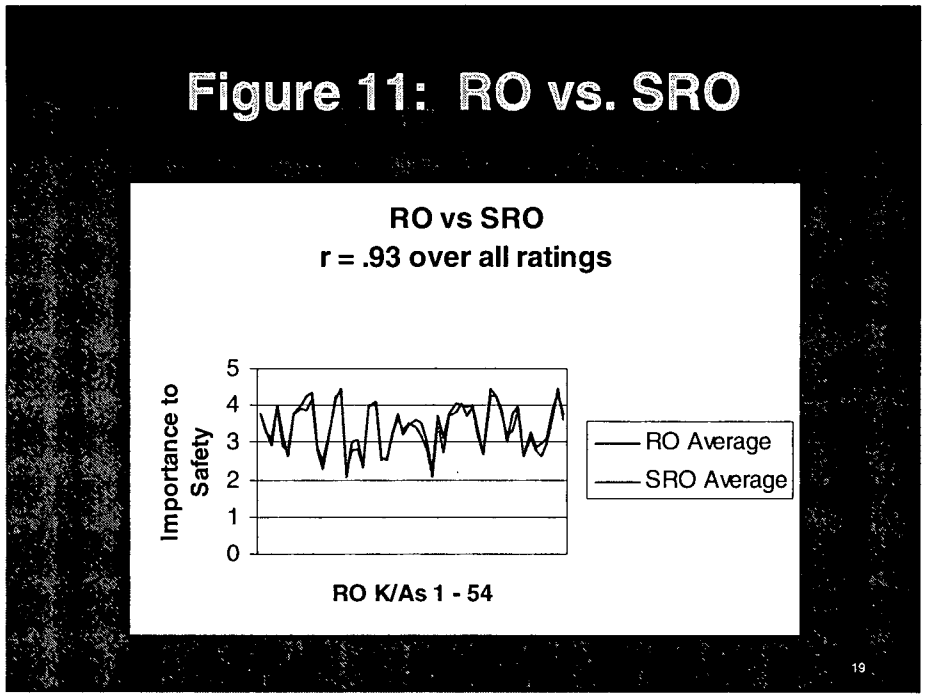
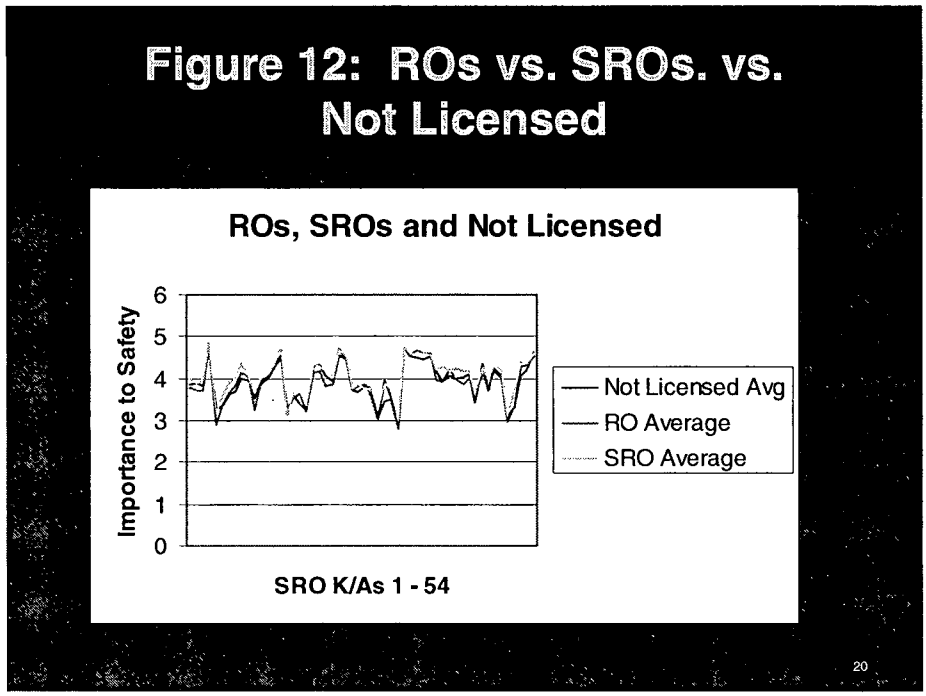


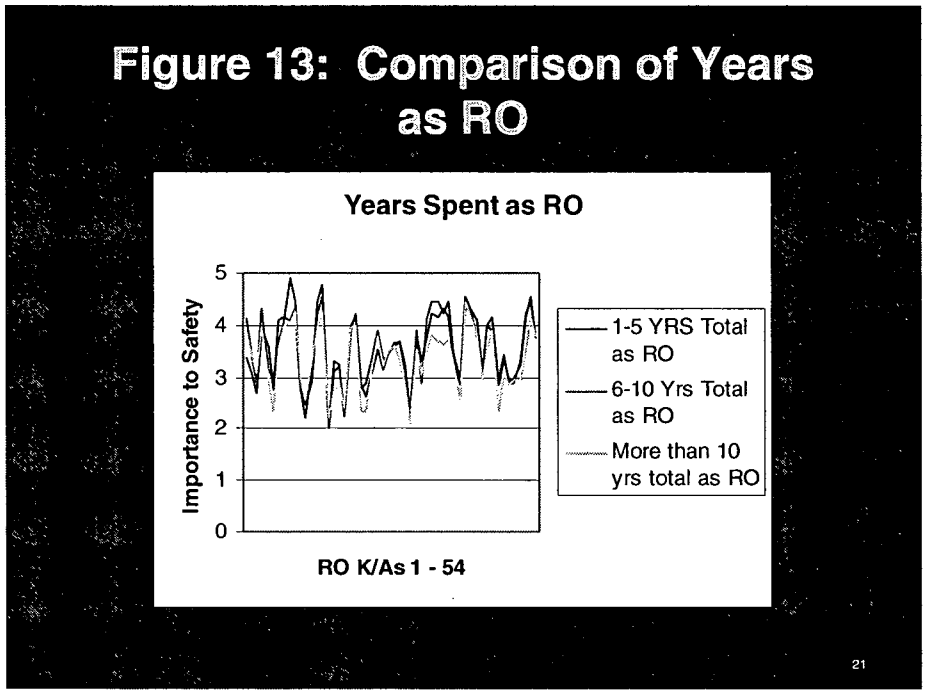
Figure 11 shows the importance ratings provided by ROs compared to those given by SROs. Again, the ratings provided by the two groups were consistent (r = 0.93).



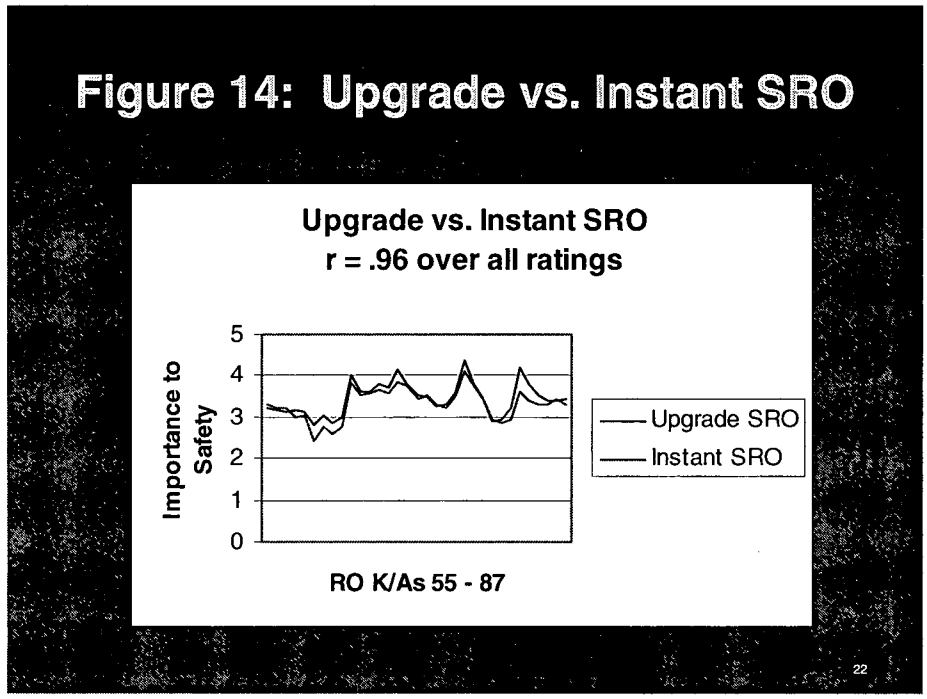
Comparisons were also made between the ratings provided by non-licensed and licensed participants, as shown in Figure 12. Figure 12 shows that the ratings provided by ROs, SROs, and non-licensed respondents were consistent (ROs vs. Not Licensed r = 0.92, SROs vs. Not Licensed r = 0.97).



No significant differences were identified in the pattern of ratings obtained from ROs with different experience levels. Figure 13 illustrates the similarities in the ratings provided by these groups (1-5 years vs. 6-10 years r = .87; 1-5 years vs. greater than 10 years r = .91; 6-10 years vs. greater than 10 years r = .86).



The importance ratings provided by the two types of SRO licenses were also compared. As can be seen in Figure 14, no significant differences in the ratings provided by Upgrade and Instant SROs were found (r = 0.96).



No differences were found in the importance ratings provided by the respondents as a function of the amount of time spent standing watch over the past five years. As can be seen in Figure 15, the pattern of ratings provided by respondents who had not stood watch in the past five years were similar to those provided by respondents who had spent the minimum time required to maintain their licenses, as well as to the ratings provided by respondents who had spent more than half of their time or all of their time standing watch in the past 5 years (minimum time vs. less than half r = .90; minimum time vs. more than half r = .90; minimum time vs. all r = .92; less than half vs. more than half r = .95; less than half vs. all r = .93; more than half vs. all r = .95).

These results differ from those obtained in the first survey. In the first survey, the amount of time the respondents had spent standing watch in the past five years was positively correlated with their importance ratings. That is, the more time a respondent had spent on watch, the higher their importance ratings. This correlation from the first survey was low, however (r = .21). The results for the same comparisons from this second survey indicate that the correlation obtained in the first survey may have been spurious.

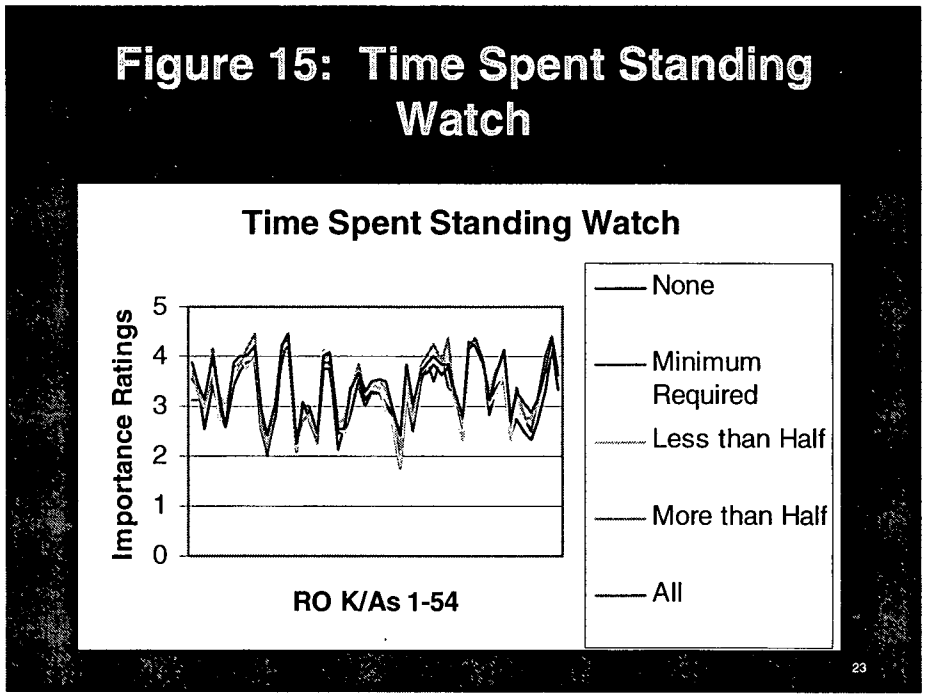
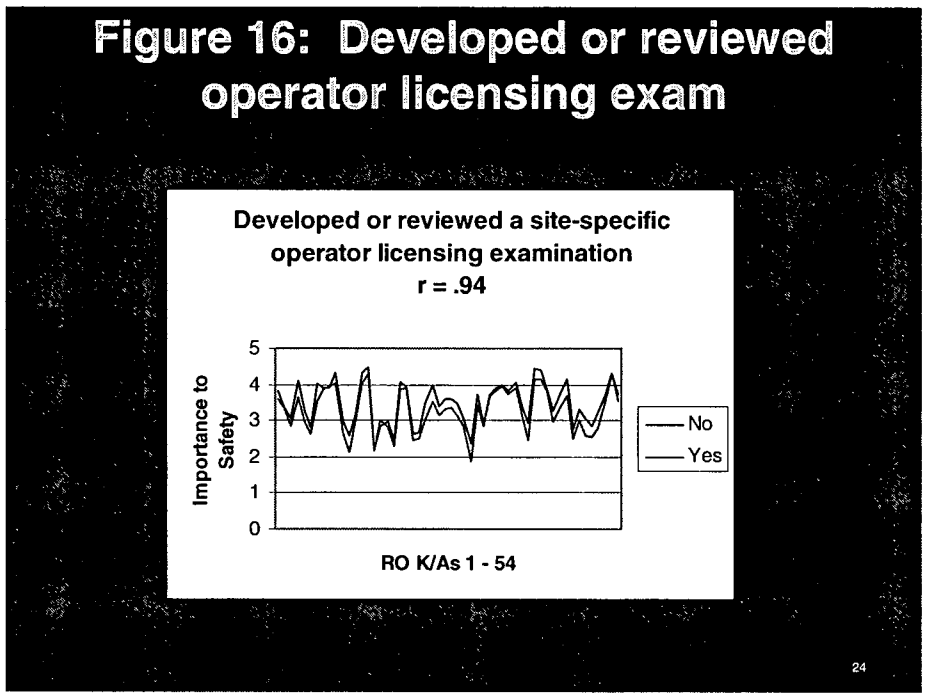
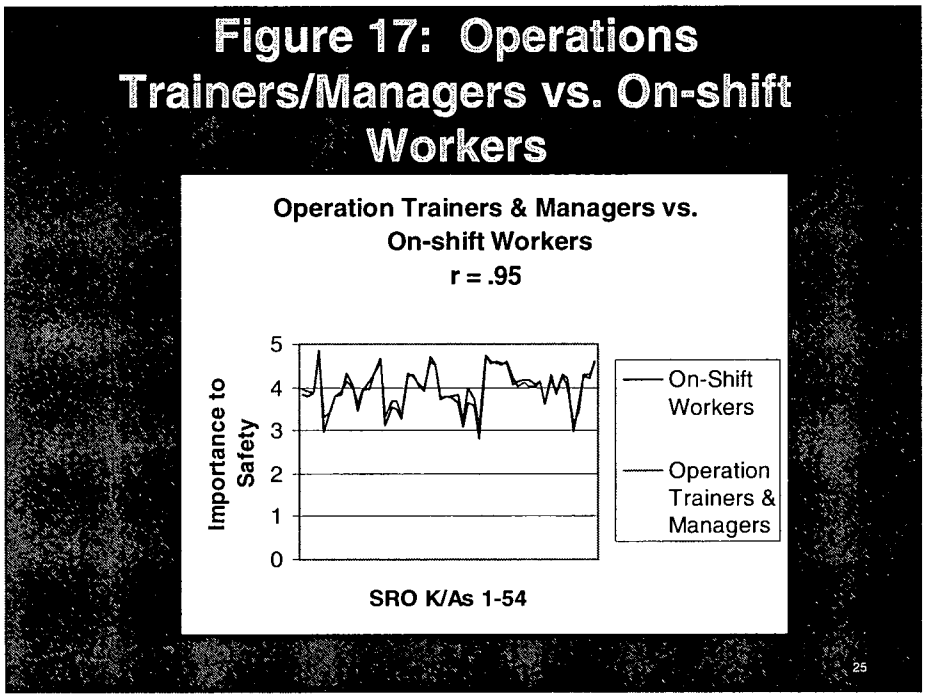


Figure 16 shows that the importance ratings provided by respondents who have developed or reviewed operator licensing exams were similar to those who have not (r = 0.94).



A final comparison was made between the importance ratings provided by operations trainers and managers and those from on-shift workers. Again, no significant differences were found in the importance ratings from these two groups (r = 0.95), as shown in Figure 17.



3.3 Importance to Safety Ratings

Consistent with the methods used to calculate the importance to safety ratings for Rev. 0 and Rev. 2 of NUREG-1122 and NUREG-1123, the average importance rating for the RO and SRO jobs was calculated for each of the 87 K/As included in the second survey. A complete list of the average importance ratings obtained from the survey for each K/A can be seen in Attachment 3. Of the 174 importance ratings (87 each for the RO and SRO jobs), four K/As (2.3%) were rated lower than 2.5 in importance to safety, but only for the RO job. None of the four were degraded voltage K/As. The four K/As with importance ratings lower than 2.5 were –

- K/A 31: Ability to approve release permits.
  RO Importance Rating: 2.0 RO Standard Deviation: 0.89

- K/A 16: Knowledge of the process for making design or operating changes to the facility.
  RO Importance Rating: 2.2 RO Standard Deviation: 0.73

- K/A 12: Knowledge of the fuel-handling responsibilities of SROs.
  RO Importance Rating: 2.2 RO Standard Deviation: 0.94

- K/A 19: Knowledge of the process for controlling temporary design changes.
  RO Importance Rating: 2.3 RO Standard Deviation: 0.70

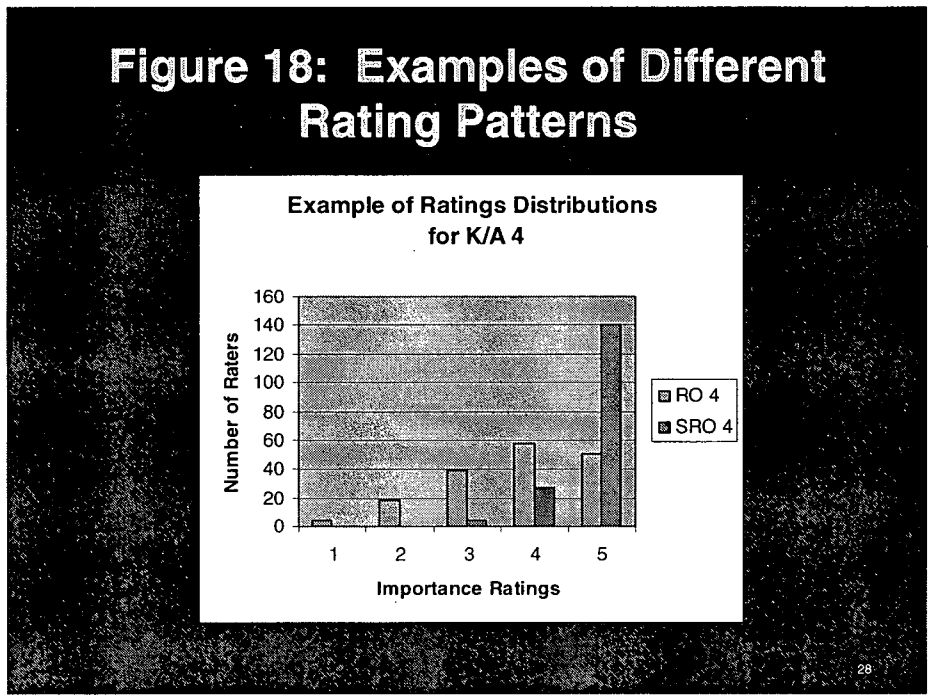
The K/As that were rated lower than 2.5 for the RO job were developed by the WOG TWG to be SRO-only K/As. Therefore, the low importance ratings for these four K/As are acceptable.

Overall, these results indicate that the proposed revisions and additions to the Section 2 K/As, if included in NUREG-1123 and NUREG-1123, would increase the number of K/As available to sample for an RO-level licensing exam. The percentage of K/As in Section 2 that would be appropriate for testing on a site-specific RO licensing exam would increase to 93% of the K/As versus 60% in the current Section 2.

3.3.1 Variability in the Importance Ratings

The degree of consensus among the survey participants in their importance ratings was assessed by calculating the standard deviation (SD) of each average importance rating for the RO and SRO jobs for each K/A. A larger SD reflects greater disagreement among the raters on the importance to safety of the K/A. An SD of 1.0 indicates that about one-third of the participants rated the K/A at least 1 rating level higher or lower than the average rating for that K/A. That is, if the average rating for a K/A was 3 (fairly important), but the ratings had an SD of 1.0, then about 15% of the participants rated it as 4 (very important) or higher in importance, and about 15% rated it as 2 (of limited importance) or lower.

Figure 18 shows the distribution of the importance ratings given by the survey respondents for the K/As that had the smallest (SRO rating for K/A 4, SD = .46) and largest (RO rating for K/A 4, SD = 1.06) SDs among all of the average importance ratings. As a general statistical rule, it would be better if the distributions of ratings for all of the K/As were similar to the distribution for the K/A 4 SRO Rating (Ability to manage the control room during plant transients), rather than to the distribution of importance ratings for K/A 4 RO Rating.



Eleven of the 174 average importance ratings from the survey had SDs greater than 1.0 (for eight separate K/As). These results indicate that the revisions made to the K/As successfully decreased the variability of the importance ratings for the K/As that were identified as problematic in the first survey. The percentage of ratings with SDs greater than 1.0 decreased from the first survey (15% of all K/A ratings) to the second survey (5% of ratings for the Section 2 K/As). Of the eleven importance ratings in the second survey that had SDs greater than 1.0, five were for new or revised K/As for Section 2 and six were from the degraded voltage K/As.

Four revised K/As from Section 2 had importance ratings with SDs greater than 1.0:

- K/A 3: Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.;
    - RO Importance Rating: 2.9 RO Standard Deviation 1.01
    - SRO Importance Rating: 3.9 SRO Standard Deviation 0.82

  Respondent comments suggest there was disagreement on the RO importance rating because of limiting the K/A to SROs only with the phrase, "ability of the SRO."

- K/A 4: Ability to manage the control room during plant transients;
    - RO Importance Rating: 3.8 RO Standard Deviation: 1.06
    - SRO Importance Rating: 4.8 SRO Standard Deviation: 0.46

Respondent comments indicate there was disagreement as to whether this K/A is an RO function.

- K/A 7: Knowledge of the station's requirements for verbal communications when implementing procedures;
    - RO Importance Rating: 3.7 RO Standard Deviation: 1.01
    - SRO Importance Rating: 3.8 SRO Standard Deviation: 0.98

  Respondent comments indicated variability in the extent to which raters believed this K/A is too easy to include in a licensing exam with recommendations that it be excluded, as it is covered in GET.

- K/A 45: Ability to verify the controlled procedure copy;
    - RO Importance Rating: 3.5 RO Standard Deviation: 1.03
    - SRO Importance Rating: 3.6 SRO Standard Deviation: 1.00

  Respondent comments indicated that this K/A is too easy and is currently addressed in GET.

Four degraded voltage K/As had SDs greater than 1.0:

- K/A 60: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: double sequencing;
    - RO Importance Rating: 2.6 RO Standard Deviation: 1.01
    - SRO Importance Rating: 2.7 SRO Standard Deviation: 1.05

  Respondent comments indicate that the phrase "double sequencing" is not understood.

- K/A 61: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Separation Criteria
    - RO Importance Rating: 3.0 RO Standard Deviation: 1.00
    - SRO Importance Rating: 3.2 SRO Standard Deviation: 0.99

  Respondent comments indicate that the term "Grid Separation Criteria" is not understood.

- K/A 62: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Reconnection Criteria.
    - RO Importance Rating: 2.8 RO Standard Deviation: 0.99
    - SRO Importance Rating: 3.1 SRO Standard Deviation: 1.04

  Comments indicate that respondents are not familiar with the term "Grid Reconnection."

- K/A 63: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Blackstart Criteria;
    - RO Importance Rating: 2.9 RO Standard Deviation: 1.01
    - SRO Importance Rating: 3.3 SRO Standard Deviation: 1.02

  Comments indicate that respondents are not familiar with the concept "Blackstart Criteria."

A complete list of the comments provided by the respondents regarding these eight K/As can be seen in Attachment 4.

Comments from participants for all of the K/As that were included in the survey can be found in Attachment 5. The majority of the comments given by respondents in the second survey were justifications or clarifications of their ratings of the K/As. Comments were also received from participants who had concerns about how an exam question would be written for some K/As. With the exception of the K/As with SDs greater than 1.0, there was no evidence that the large majority of the K/As were interpreted differently by different respondents and few suggestions for revisions to the K/As were offered.

3.3.2 Improvements to the K/As in Subsection 2.3, Radiation Protection

An important goal of the revisions to Section 2 developed by the WOG TWG was to improve the relevance to licensed operator duties of the Radiation Protection K/As contained in Subsection 2.3 of the current Catalogs. As can be seen in Table 3, the importance ratings for these K/As are generally low (the SDs of these ratings are unavailable).

Table 3: Subsection 2.3 Radiation Protection K/As		
Current K/As	**Catalog Ratings**	
	RO	**SRO**
2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements	2.6	3.0
2.3.2 Knowledge of facility ALARA program.	2.5	2.9
2.3.3 Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g. waste disposal and handling system).	1.8	2.9
2.3.4 Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	2.5	3.1
2.3.5 Knowledge of use and function of personnel monitoring equipment.	2.3	2.5
2.3.6 Knowledge of the requirements for reviewing and approving release permits.	2.1	3.1
2.3.7 Knowledge of the process for preparing a radiation work permit.	2.0	3.3
2.3.8 Knowledge of the process for performing a planned gaseous radioactive release.	2.3	3.2
2.3.9 Knowledge of the process for performing a containment purge.	2.5	3.4
2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	3.3
2.3.11 Ability to control radiation releases.	2.7	3.2

Table 4 shows the average importance ratings and SDs obtained in the second survey for the new and revised K/As developed by the WOG TWG, as revised by the NRC staff.

Table 4: New Subsection 2.3 K/As				
Current K/As	**Second Survey Ratings**		**Second Survey Standard Deviations**	
	RO	**SRO**	**RO**	**SRO**
2.3.1 Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.	3.2	3.7	.95	.82
2.3.2 Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.	3.4	3.8	.91	.81
2.3.3 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	3.8	.78	.75
2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	3.7	.89	.83
2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	2.9	.98	.98
2.3.6 Ability to approve release permits.	2.0	3.8	.89	.93
2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	3.6	.98	.91
2.3.8 Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	3.1	.89	.81
2.3.9 Ability to control radiation releases.	3.8	4.3	.91	.78

A comparison of Tables 3 and 4 shows that the average importance ratings for the revised K/As are substantially higher than the ratings for the K/As in current Subsection 2.3. In addition, none of the importance ratings for the revised K/As had SDs greater than 1.0. Therefore, including the new K/As to replace those in current Subsection 2.3 is appropriate.

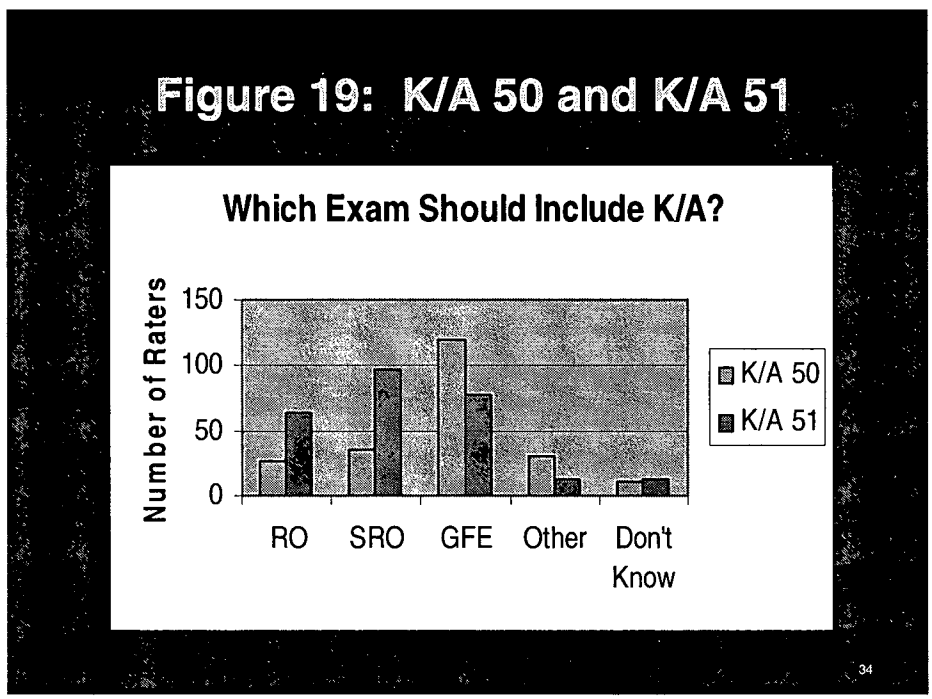
3.4 Testing the K/As on RO and SRO Licensing Examinations

Participants were also asked to provide their judgments of which of several types of exams to which operators are subject should include questions for two K/As that the NRC had requested be added to the GFE section:

- K/A 50: Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.; and
- K/A 51: Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc. The response options for these questions were:

- RO site-specific exam
- SRO site-specific exam
- General Fundamental Exam
- Other (GET, Radiation Worker, Fire Protection, etc.)
- Don't know

Participants were permitted to select multiple response options (i.e., "vote" for more than one exam). The number of "votes" for each option for each K/A was then counted and compared to the total number of "votes" given by the respondents for the K/A. Results are shown in Figures 19.



For K/A 50 (Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.), the majority of participants endorsed including K/A 50 on the General Fundamental Exam (54%), rather than on the site-specific RO or SRO exams. Respondent comments are shown in Attachment 6. The resulting opinions for this question were:

- RO site-specific exam: 12%
- SRO site-specific exam: 16%
- General Fundamental Exam: 54%
- Other (GET, Radiation Worker, Fire Protection, etc.): 14%
- Don't know: 5%

There was no clear majority opinion among the participants for which exam should be used to test K/A 51 (Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.). Results for this question were:

- RO site-specific exam: 24%
- SRO site-specific exam: 37%
- General Fundamental Exam: 30%
- Other (GET, Radiation Worker, Fire Protection, etc.): 4.5%
- Don't know: 4.5%

3.5 Summary of Survey Results

In summary:

- The demographic characteristics of the respondents to the second survey were very similar to those of the respondents in the first survey. As was found in the first survey, different groups of respondents gave very similar importance ratings. Most importantly, no systematic differences were found in the ratings provided by operations personnel from PWRs and BWRs. These results indicate that it is acceptable to use the importance ratings from the two surveys to replace those in Section 2 of both NUREG-1122 and NUREG-1123.
- Overall, the results of this second survey demonstrated that the large majority of the revised and new K/As are acceptable for inclusion in revisions to NUREG-1122 and NUREG-1123. The majority of importance ratings obtained for the revised and new K/As exceeded 2.5 with little undesirable variability in the participants' importance ratings.
- Four K/As had average importance ratings under 2.5 for the RO job, which is acceptable because each of these K/As was revised to address SRO job responsibilities. Overall, replacing the current K/As with the new and revised

K/As for Section 2 would increase the number of K/As that are appropriate for testing in an RO-level licensing exam;

- The average importance ratings and consistency of the ratings obtained for the proposed new K/As for Subsection 2.3, Radiation Protection, were higher than those obtained in the first survey for the current Subsection 2.3 K/As. These results suggest that replacing the current K/As in this subsection is desirable;
- Eleven importance ratings distributed among eight of the new and revised K/As showed substantial variability among the raters, indicating that these K/As may require additional updating or clarification (five of the ratings were from the new or revised K/As for Section 2, six were from the proposed Section 4 K/As);
- Participant responses to which of several types of exams should include questions for K/A 50, "Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.," resulted in 54% of respondents choosing the General Fundamental Exam as the appropriate examination to include questions related to this K/A. These findings indicate that it may be inappropriate to include this K/A in Section 2;
- Participant responses to which of several types of exams should include questions for K/A 51, "Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.," resulted in 37% of respondents choosing the SRO site-specific exam, 24% choosing the RO site-specific exam, and 30% choosing General Fundamental Exam.

4 STEPS TO PROJECT COMPLETION

4.1 Recommended Steps

- A meeting of the PWR OG & BWR OG representatives was held on August 28th & 29th to review the results of the second survey. Final recommendations (add the new K/As; and replace existing problematic K/As with the revised K/As, as shown in Attachment 3) along with Importance to Safety Ratings obtained from the first survey for K/As that were not identified as problematic (See Attachment 7) to NUREG 1122 & 1123 were made. Those recommended revisions to NUREG-1122 and NUREG-1123 will be submitted to the NRC.
- For the four degraded voltage K/As that included unfamiliar terminology, recommend to the NRC that those K/As be revised to clarify them, and then consider a very short third survey to obtain ratings on the clarified K/As. If a third survey is undesirable, consider not adding these K/As to the Catalogs.
- From K/A 3, remove "of the SRO" and include the K/A, with the importance ratings obtained from this second survey, in the Catalogs.

At this time, the PWR OG and BWR OG does not anticipate that the proposed revisions to the Generic K/As would require any conforming changes to NUREG-1021.

ATTACHMENTS

ATTACHMENT 1: Second Validation Survey K/As

Source: WOG TWG working session held at the Westinghouse Energy Center in Monroeville, PA, May 16-18, 2005. Reported in Project to Update Section 2, "Generic Knowledges and Abilities," of NUREG-1122, August 8, 2005, Attachment 6, Table 1.

- K/A 1: Knowledge of shift or short-term relief turnover practices.
- K/A 2: Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.
- K/A 3: Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.
- K/A 4: Ability to manage the control room during plant transients.
- K/A 5: Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.
- K/A 6: Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.
- K/A 7: Knowledge of the station's requirements for verbal communications when implementing procedures.
- K/A 8: Ability to use plant computers to evaluate system or component status.
- K/A 9: Ability to interpret reference materials, such as graphs, curves, tables, etc.
- K/A 10: Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.
- K/A 11: Knowledge of primary and secondary plant chemistry limits.
- K/A 14: Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc.
- K/A 16: Knowledge of the process for making design or operating changes to the facility.
- K/A 17: Knowledge of the process for making changes to procedures.
- K/A 18: Knowledge of the process for conducting special or infrequent tests.
- K/A 19: Knowledge of the process for controlling temporary design changes.
- K/A 20: Knowledge of the process for controlling equipment configuration or status.
- K/A 21: Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, lineups, tag-outs, etc.
- K/A 22: Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, etc.
- K/A 23: Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.
- K/A 24: Ability to track Technical Specification limiting conditions for operations.
- K/A 34: Knowledge of EOP mitigation strategies.
- K/A 35: Knowledge of how abnormal operating procedures are used in conjunction with EOPs.
- K/A 36: Knowledge of crew roles and responsibilities during EOP usage.

- K/A 37: Knowledge of general guidelines for EOP usage.
- K/A 38: Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.
- K/A 39: Knowledge of procedures relating to a security event.
- K/A 40: Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies.
- K/A 41: Knowledge of annunciator alarms, indications, or response procedures.
- K/A 42: Knowledge of RO tasks performed outside the main control room during an emergency and the resulting operational effects.
- K/A 43: Knowledge of local auxiliary operator tasks during an emergency and the resulting operational effects.
- K/A 44: Knowledge of the lines of authority during implementation of the emergency plan.
- K/A 45: Ability to verify the controlled procedure copy.

Source: WOG TWG working session held at the Westinghouse Energy Center in Monroeville, PA, May 16-18, 2005. Reported in Project to Update Section 2, "Generic Knowledges and Abilities," of NUREG-1122, August 8, 2005, Attachment 6, Table 2.

- K/A 12: Knowledge of the fuel-handling responsibilities of SROs.
- K/A 13: Knowledge of procedures and limitations involved in core alterations.
- K/A 25: Ability to determine Technical Specification Mode of Operation.

Source: WOG TWG working session held at the Westinghouse Energy Center in Monroeville, PA, May 16-18, 2005. Reported in Project to Update Section 2, "Generic Knowledges and Abilities," of NUREG-1122, August 8, 2005, Attachment 6, Table 3.

- K/A 15: Knowledge of procedures, guidelines, or limitations associated with reactivity management. K/A 26: Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.
- K/A 27: Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.
- K/A 28: Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.
- K/A 29: Knowledge of radiation exposure limits under normal or emergency conditions.
- K/A 30: Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.

- K/A 31: Ability to approve release permits.
- K/A 32: Ability to comply with radiation work permit requirements during normal or abnormal conditions.
- K/A 33: Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
- K/A 46: Ability to control radiation releases.

Source: Summary of February 16, 2006 Teleconference (attendees NRC: Fred Gunter, John Munro, George Usova, Girija Shukla, BWROG: Ken McCall; WOG: Charles Sawyer, Paul Hippely, John Hilton, Steve DiTommaso, Lynn Moyer, Christine DiMuzio): NRC Request of three specific K/As to be added to the Generic Section to address Commission concerns over grid communication. The WOG, via Westinghouse (Shiffley letter, dated 11/29/05) agreed to include the following K/As in its survey validation.

- K/A 47: Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.
- K/A 48: Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.
- K/A 49: Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.

Source: Summary of February 16, 2006 Teleconference (attendees NRC: Fred Gunter, John Munro, George Usova, Girija Shukla, BWROG: Ken McCall; PWR OG: Charles Sawyer, Paul Hippely, John Hilton, Steve DiTommaso, Lynn Moyer, Christine DiMuzio):

- K/A 50: Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.
- K/A 51: Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.
- K/A 52: Knowledge of conservative decision making practices.
- K/A 53: Ability to identify and interpret diverse indications to validate the response of another indicator.
- K/A 54: Ability to determine operability and/or availability of safety related equipment.

Source: APE: BWR Generator Voltage and Electric Grid Disturbances

- K/A 55: Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Definition of terms: volts, watts, amps, vars, power factor.
- K/A 56: Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Over excitation.
- K/A 57: Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Under excitation.
- K/A 58: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: motors.
- K/A 59: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: breakers, relays.
- K/A 60: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: double sequencing.
- K/A 61: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Separation Criteria
- K/A 62: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Reconnection Criteria.
- K/A 63: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Blackstart Criteria.
- K/A 64: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Reactor and Turbine Trip Criteria.
- K/A 65: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Actions contained in AOP for Voltage and Grid disturbances.
- K/A 66: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage.
- K/A 67: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Turbine/Generator controls.
- K/A 68: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Voltage Regulator controls.
- K/A 69: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Reactor controls.
- K/A 70: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Engineered safety features.
- K/A 71: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operating point on the Generator capability.
- K/A 72: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: VARS outside capability curve.

- K/A 73: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of offsite circuit operability.
- K/A 74: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Generator frequency limitations.
- K/A 75: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of engineered safety features.
- K/A 76: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Criteria to trip the turbine or reactor.
- K/A 77: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of EDGs.
- K/A 78: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Generator overheating and the required actions.

Source: APE: 077 Generator Voltage and Electric Grid Disturbances, those K/As that are not duplicates of the BWR APEs.

- K/A 79: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: sensors, detectors, indicators.
- K/A 80: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: controllers and positioners.
- K/A 81: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: pumps.
- K/A 82: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Reactor Power.
- K/A 83: Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Turbine/Generator control.
- K/A 84: Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage outside the generator capability curve.
- K/A 85: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Voltage outside the generator capability curve.
- K/A 86: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: MVARS outside capability curve.
- K/A 87: Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Generator Current outside the capability curve.

ATTACHMENT 2: Instructions to Survey Participants

Introduction

Welcome and thank you for agreeing to participate in this survey, sponsored by the Westinghouse Owners' Group Training Working Group (WOG TWG) and Boiling Water Reactor Owners' Group (BWROG).

To those of you who participated in the first survey, we hope you have been told that your input was extremely informative, thorough, and useful. Thank you for spending the large amount of time that completing the first survey required, and for agreeing to participate in this second effort.

To those of you who are participating in the project for the first time, thank you for agreeing to participate and spending the time required.

Purpose of the Project

The purpose of this project is to update Section 2: "Generic Knowledges and Abilities" of NUREG-1122 (Rev. 2), Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors , and NUREG-1123 (Rev.2), Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors (i.e., the K/A Catalogs)..

Purpose of this Second Survey

As a result of the responses to the last survey, the WOG TWG has revised several of the K/As in Section 2: "Generic Knowledges and Abilities" of the K/A Catalogs, and developed several new K/As. In addition, the NRC has requested that we obtain ratings on K/As that they intend to add to Section 2 and Section 4. Therefore, the purpose of this second survey is to obtain your "Importance to Safety" ratings for the new and revised K/As.

Background

The K/A Catalogs list the knowledge and abilities that licensed operators must have in order to operate a nuclear plant safely. It is used to develop the written portion of a site-specific operator licensing exam. Exam developers randomly sample K/As from the applicable catalog and then write exam questions to test the candidates' understanding of the K/As that were randomly selected. In the context of a written exam, exam developers use the technical term, ***mastery*** (which you will see used in the survey), to mean that a candidate is able to correctly answer exam questions that test the candidate's understanding of a K/A.

The original K/A Catalogs were developed nearly 20 years ago and re-organized and revised about 10 years ago. Since the Catalogs were last revised, the industry has undergone a number of changes. These changes may have impacted the knowledge and abilities that Reactor Operators (ROs) and Senior Reactor Operators (SROs) must have to operate safely. The importance to safety of some of the K/As in the Catalogs may also have changed.

The first survey was administered between October 2004 and April 2005 of the 129 K/As that are currently listed in Section 2 to answer the following questions: Do the importance to safety ratings for each generic K/A continue to be accurate in today's operating environment? Are there other generic K/As that should be added to the Catalogs: and should the existing generic K/As continue to be used as they are currently written, clarified, or revised based on industry operating and licensing exam experience? Information collected from this survey was used by the WOG TWG to develop recommendations for adding and revising K/As to increase their relevance to today's operating environment.

The BWROG reviewed the information collected by the WOG TWG to ensure compatibility with the BWR design.

Instructions

The questions in this survey ask for your "Importance to Safety" ratings for 87 K/As. The survey asks you to provide your ratings for both the RO and SRO jobs. "Additional Comments" text boxes are also provided for you to type in any comments you may have on the K/As, explain your answers, or make suggestions for further revisions. Although the text boxes appear to be small on the survey pages, they will accept comments that are up to 250 characters in length.

Because this survey includes only 87 K/As and only asks for importance ratings, working through it will take much less of your time than the last survey required. If you are unable to finish the survey in one sitting, you will be able to return to it. The survey is designed so that you can work through it at your own pace and on your own schedule. When you need to take a break, you don't have to logout -- just close your browser window. When you login again to work on the survey, you will need to use the links provided to you in the initial e-mail. We expect that completing this survey should take about 30 to 45 minutes of your time.

As a reminder, please don't use the "back" or "refresh" buttons in your browser. The survey software is designed for you to use the buttons provided at the bottom of each page to navigate between questions.

If you have questions at any time, please feel free to call Lynn Moyer at 717-691-0369 or send an email to her at lmoyer@psha-inc.com.

Confidentiality of Your Answers

No-one within your organization will have access to the answers you provide to this survey. In fact, the members of the WOG TWG and BWROG won't have access to them either, except in the aggregate. The only person who will be able to link you with your answers will be Lynn Moyer from PSHA, which is the company that has been hired by the WOG TWG to conduct the survey. They need to be able to link your e-mail address with your answers so that they can contact you, if more information is needed or there has been a problem with the survey software.

The PWR OG TWG and BWROG greatly appreciates your willingness to participate.

Ready to begin? Click on the "Next Page" button below.

ATTACHMENT 3: Importance Ratings, Standard Deviations, and Recommendations for New and Revised K/As

Revised K/A 1							
Current K/A				**Revised K/A**			
2.1.3 Knowledge of shift turnover practices.				2.1.3 Knowledge of shift or short-term relief turnover practices.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.5	**3.6**	**.99**	**1.00**	**3.7**	**3.9**	**.97**	**.90**
Recommendation:		*Replace Current K/A*					

New K/A 2							
Current K/A				**Revised K/A**			
2.1.4 Knowledge of shift staffing requirements.				2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.9	**3.8**	**.95**	**.96**	**3.3**	**3.8**	**.96**	**.87**
Recommendation:		*Replace Current K/A*					

Revised K/A 3							
Current K/A				**Revised K/A**			
2.1.5 Ability to locate and use procedures and directives related to shift staffing and activities.				2.1.5 Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.9	**3.8**	**1.04**	**1.0**	**2.9**	**3.9**	**1.01**	**.82**
Recommendation:	*Take out "of the SRO" and use these ratings to replace the current K/A. Comments from survey participants indicate this job is applicable to RO jobs at certain plants. Add asterisk to RO rating indicating that there was disagreement among the raters about the applicability of this K/A to the RO job. Revised K/A 2.1.5: Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.*						

Revised K/A 4							
Current K/A				**Revised K/A**			
2.1.6 Ability to supervise and assume a management role during transients and upset conditions.				2.1.6 Ability to manage the control room crew during plant transients.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.4	**4.7**	**1.07**	**.57**	**3.8**	**4.8**	**1.06**	**.46**
Recommendation:	*Put an asterisk next to the RO rating in the Catalog or a footnote, indicating that there was disagreement among the raters about the applicability of this K/A to the RO job.*						

Revised K/A 5							
Current K/A				**Revised K/A**			
2.1.14 Knowledge of system status criteria which require notification of plant personnel.				2.1.14 Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.9	**3.9**	**1.02**	**.93**	**3.1**	**3.1**	**.95**	**.96**
Recommendation:	*Replace Current K/A*						

Revised K/A 6							
Current K/A				**Revised K/A**			
2.1.15 Ability to manage short-term information such as night and standing orders.				2.1.15 Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.7	**3.3**	**1.01**	**1.01**	**2.7**	**3.4**	**.79**	**.80**
Recommendation:		*Replace Current K/A*					

Revised K/A 7							
Current K/A				**Revised K/A**			
2.4.15 Knowledge of communications procedures associated with EOP implementation.				2.1.38 Knowledge of the station's requirements for verbal communications when implementing procedures.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.4	**3.8**	**1.01**	**.87**	**3.7**	**3.8**	**1.01**	**.98**
Recommendation:		*Put an asterisk next to the RO rating in the Catalog or a footnote, indicating that there was disagreement among the raters about the applicability of this K/A to the RO job.*					

Revised K/A 8							
Current K/A				**Revised K/A**			
2.1.19 Ability to use plant computer to obtain and evaluate parametric information on system or component status.				2.1.19 Ability to use plant computers to evaluate system or component status.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.9	**3.8**	**.89**	**.88**	**3.9**	**3.8**	**.79**	**.78**
Recommendation:		*Replace Current K/A*					

Revised K/A 9							
Current K/A				**Revised K/A**			
2.1.25 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.				2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.3	**3.6**	**.98**	**.98**	**3.9**	**4.2**	**.75**	**.69**
Recommendation:		*Replace Current K/A*					

Revised K/A 10							
Current K/A				**Revised K/A**			
2.1.29 Knowledge of how to conduct and verify valve lineups.				2.1.29 Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.7	**3.6**	**1.01**	**.91**	**4.1**	**4.0**	**.79**	**.80**
Recommendation:		*Replace Current K/A*					

Revised K/A 11							
Current K/A				**Revised K/A**			
2.1.34 Ability to maintain primary and secondary plant chemistry within allowable limits.				2.1.34 Knowledge of primary and secondary plant chemistry limits.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.6	**3.0**	**.94**	**1.02**	**2.7**	**3.5**	**.77**	**.84**
Recommendation:		*Replace Current K/A*					

Revised K/A 12							
Current K/A				**Revised K/A**			
2.2.29 Knowledge of SRO fuel handling responsibilities.				2.1.35 Knowledge of the fuel-handling responsibilities of SROs.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.0	**4.1**	**.90**	**.72**	**2.2**	**3.9**	**.94**	**.83**
Recommendation:		*Replace Current K/A*					

Revised K/A 13							
Current K/A				**Revised K/A**			
2.2.31 Knowledge of procedures and limitations involved in initial core loading.				2.1.36 Knowledge of procedures and limitations involved in core alterations.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.5	**3.2**	**1.08**	**1.21**	**3.0**	**4.1**	**.92**	**.73**
Recommendation:		*Replace Current K/A*					

Revised K/A 14							
Current K/A				**Revised K/A**			
2.2.34 Knowledge of the process for determining the internal and external effects on core reactivity.				2.1.43 Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.9	**4.0**	**.91**	**.86**	**4.1**	**4.3**	**.89**	**.77**
Recommendation:		*Replace Current K/A*					

New K/A 15							
Current K/A				**New**			
				2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				4.3	**4.6**	**.70**	**.53**
Recommendation:		*Add to Catalog*					

Revised K/A 16							
Current K/A				**Revised K/A**			
2.2.5 Knowledge of the process for making changes in the facility as described in the FSAR.				2.2.5 Knowledge of the process for making design or operating changes to the facility.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.2	**3.2**	**.79**	**1.03**	**2.2**	**3.2**	**.73**	**.82**
Recommendation:		*Replace Current K/A*					

Revised K/A 17							
Current K/A				**Revised K/A**			
2.2.6 Knowledge of the process for making changes in procedures as described in the safety analysis report.				2.2.6 Knowledge of the process for making changes to procedures.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.9	**3.7**	**.85**	**.83**	**3.0**	**3.6**	**.84**	**.78**
Recommendation:	*Replace Current K/A*						

Revised K/A 18							
Current K/A				**Revised K/A**			
2.2.7 Knowledge of the process for conducting tests or experiments not in FSAR.				2.2.7 Knowledge of the process for conducting special or infrequent tests.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.6	**3.4**	**.91**	**1.07**	**2.9**	**3.6**	**.84**	**.76**
Recommendation:	*Replace Current K/A*						

Revised K/A 19							
Current K/A				**Revised K/A**			
2.2.11 Knowledge of the process for controlling temporary changes.				2.2.11 Knowledge of the process for controlling temporary design changes.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.7	**3.7**	**.88**	**.78**	**2.3**	**3.3**	**.70**	**.80**
Recommendation:	*Replace Current K/A*						

Revised K/A 20							
Current K/A				**Revised K/A**			
2.2.14 Knowledge of the process for making configuration changes.				2.2.14 Knowledge of the process for controlling equipment configuration or status.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.0	**3.8**	**.93**	**.85**	**3.9**	**4.3**	**.75**	**.66**
Recommendation:		*Replace Current K/A*					

Revised K/A 21							
Current K/A				**Revised K/A**			
2.2.15 Ability to identify and utilize as-built design and configuration change documentation to ascertain expected current plant configuration and operate the plant.				2.2.15 Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.8	**3.3**	**1.05**	**1.03**	**3.9**	**4.3**	**.74**	**.68**
Recommendation:		*Replace Current K/A*					

Revised K/A 22							
Current K/A				**Revised K/A**			
2.2.17 Knowledge of the process for managing maintenance activities during power operations.				2.2.17 Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.7	**4.0**	**.82**	**.80**	**2.5**	**4.0**	**.74**	**.72**
Recommendation:		*Delete current K/A and replace with New K/A 47: Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.*					

Revised K/A 23							
Current K/A				**Revised K/A**			
2.2.18 Knowledge of the process for managing maintenance activities during shutdown operations				2.2.18 Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.8	**4.0**	**.86**	**.78**	**2.6**	**3.9**	**.80**	**.74**
Recommendation:		*Replace Current K/A*					

Revised K/A 24							
Current K/A				**Revised K/A**			
2.2.23 Ability to track limiting conditions for operations.				2.2.23 Ability to track Technical Specification limiting conditions for operations.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.1	**4.3**	**.87**	**.67**	**3.1**	**4.6**	**.87**	**.53**
Recommendation:		*Replace Current K/A*					

Revised K/A 25							
Current K/A				**Revised K/A**			
2.1.22 Ability to determine Mode of Operation.				2.2.35 Ability to determine Technical Specification Mode of Operation.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.8	**4.1**	**1.02**	**.97**	**3.6**	**4.5**	**.85**	**.69**
Recommendation:		*Replace Current K/A*					

New K/A 26							
Current K/A				**New K/A**			
				2.3.1 Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.2	**3.7**	**.95**	**.82**
Recommendation:	*Add to Catalog*						

New K/A 27							
Current K/A				**New K/A**			
				2.3.2 Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.4	**3.8**	**.91**	**.81**
Recommendation:	*Add to Catalog*						

New K/A 28							
Current K/A				**New K/A**			
				2.3.3 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.4	**3.8**	**.78**	**.75**
Recommendation:	*Add to Catalog*						

New K/A 29							
Current K/A				**New K/A**			
				2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.2	**3.7**	**.89**	**.83**
Recommendation:	*Add to Catalog*						

New K/A 30							
Current K/A				**New K/A**			
				2.3.8 Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.9	**3.1**	**.89**	**.81**
Recommendation:	*Add to Catalog*						

New K/A 31							
Current K/A				**New K/A**			
				2.3.6 Ability to approve release permits.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.0	**3.8**	**.89**	**.93**
Recommendation:	*Add to Catalog*						

New K/A 32							
Current K/A				**New K/A**			
				2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.5	**3.6**	**.98**	**.91**
Recommendation:	*Add to Catalog*						

New K/A 33							
Current K/A				**New K/A**			
				2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.9	**2.9**	**.98**	**.98**
Recommendation:	*Add to Catalog*						

Revised K/A 34							
Current K/A				**Revised K/A**			
2.4.6 Knowledge of symptom based EOP mitigation strategies.				2.4.6 Knowledge of EOP mitigation strategies.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.7	**4.4**	**.78**	**.72**	**3.7**	**4.7**	**.72**	**.47**
Recommendation:	*Replace Current K/A*						

Revised K/A 35							
Current K/A				**Revised K/A**			
2.4.8 Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.				2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.6	**4.2**	**.87**	**.84**	**3.8**	**4.5**	**.72**	**.65**
Recommendation:		*Replace Current K/A*					

Revised K/A 36							
Current K/A				**Revised K/A**			
2.4.13 Knowledge of crew roles and responsibilities during EOP flowchart use.				2.4.13 Knowledge of crew roles and responsibilities during EOP usage.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.4	**3.8**	**1.19**	**1.25**	**4.0**	**4.6**	**.82**	**.62**
Recommendation:		*Replace Current K/A*					

Revised K/A 37							
Current K/A				**Revised K/A**			
2.4.14 Knowledge of general guidelines for EOP flowchart use.				2.4.14 Knowledge of general guidelines for EOP usage.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.2	**3.9**	**1.13**	**1.25**	**3.8**	**4.5**	**.78**	**.59**
Recommendation:		*Replace Current K/A*					

Revised K/A 38							
Current K/A				**Revised K/A**			
2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity control 2. Core cooling 3. Reactor coolant system integrity and heat removal 4. Containment conditions 5. Radioactivity release control.				2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
4.0	**4.6**	**.89**	**.60**	**4.0**	**4.6**	**.85**	**.60**
Recommendation:		*Replace Current K/A*					

Revised K/A 39							
Current K/A				**Revised K/A**			
2.4.28 Knowledge of procedures relating to emergency response to sabotage.				2.4.28 Knowledge of procedures relating to a security event.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.1	**4.0**	**.91**	**.82**	**3.2**	**4.1**	**.80**	**.74**
Recommendation:		*Replace Current K/A*					

Revised K/A 40							
Current K/A				**Revised K/A**			
2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies.				2.4.30 Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
2.6	**4.2**	**.73**	**.76**	**2.6**	**4.1**	**.86**	**.74**
Recommendation:		*Delete Current K/A and replace with new K/A 49: Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.*					

Revised K/A 41							
Current K/A				**Revised K/A**			
2.4.31 Knowledge of annunciators alarms and indications, and use of the response instructions.				2.4.31 Knowledge of annunciator alarms, indications, or response procedures.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
4.1	**4.0**	**.71**	**.72**	**4.2**	**4.1**	**.65**	**.71**
Recommendation:		*Replace Current K/A*					

Revised K/A 42							
Current K/A				**Revised K/A**			
2.4.34 Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.				2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
4.1	**4.0**	**.68**	**.77**	**4.2**	**4.1**	**.69**	**.70**
Recommendation:		*Replace Current K/A*					

Revised K/A 43							
Current K/A				**Revised K/A**			
2.4.35 Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.				2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.6	**3.8**	**.86**	**.81**	**3.8**	**4.0**	**.74**	**.72**
Recommendation:		*Replace Current K/A*					

Revised K/A 44							
Current K/A				**Revised K/A**			
2.4.37 Knowledge of the lines of authority during an emergency.				2.4.37 Knowledge of the lines of authority during implementation of the emergency plan.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.2	**4.1**	**1.09**	**.90**	**3.0**	**4.1**	**.99**	**.72**
Recommendation:		*Replace Current K/A*					

Revised K/A 45							
Current K/A				**Revised K/A**			
2.1.21 Ability to obtain and verify controlled procedure copy.				2.1.21 Ability to verify the controlled procedure copy.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
3.5	**3.5**	**1.06**	**1.07**	**3.5**	**3.6**	**1.03**	**1.0**
Recommendation:		*Put an asterisk next to the RO and SRO ratings in the Catalog or a footnote, indicating that there was disagreement among the raters about the applicability of this K/A to the RO and SRO job.*					

New K/A 46							
Current K/A				**New K/A**			
				2.3.9 Ability to control radiation releases.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.8	**4.3**	**.91**	**.78**
Recommendation:		*Add to Catalog*					

New K/A 47							
Current K/A				**New K/A**			
				Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.6	**3.8**	**.82**	**.75**
Recommendation:	*Re-number as 2.2.17 and replace existing K/A.*						

New K/A 48							
Current K/A				**New K/A**			
				Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.1	**4.2**	**.81**	**.70**
Recommendation:	*Add to Catalog as K/A 2.2.36*						

New K/A 49							
Current K/A				**New K/A**			
				Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.7	**4.1**	**.84**	**.70**
Recommendation:	*Re-number as 2.4.30 and replace existing K/A.*						

New K/A 50							
Current K/A				**New K/A**			
				Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.6	**3.1**	**.89**	**.89**
Recommendation:	*Include in GFE*						

New K/A 51							
Current K/A				**New K/A**			
				Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.9	**3.5**	**.82**	**.82**
Recommendation:	*No clear majority; GFE most applicable as content is already taught and can be listed there, yet survey results do not support this..*						

New K/A 52							
Current K/A				**New K/A**			
				Knowledge of conservative decision making practices.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**4.3**	**.89**	**.79**
Recommendation:	*Add to Catalog as K/A 2.1.39*						

New K/A 53							
Current K/A				**New K/A**			
				Ability to identify and interpret diverse indications to validate the response of another indicator.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				4.3	**4.3**	**.68**	**.67**
Recommendation:	*Add to Catalog as K/A as K/A 2.1.45*						

New K/A 54							
Current K/A				**New K/A**			
				Ability to determine operability and/or availability of safety related equipment.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**4.6**	**.74**	**.53**
Recommendation:	*Add to Catalog as K/A 2.2.37*						

New Degraded Voltage K/A 55							
Current K/A				**New K/A**			
				Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Definition of terms: volts, watts, amps, vars, power factor.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.3	**3.5**	**.95**	**.97**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 56							
Current K/A				**Revised K/A**			
				Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Over excitation.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.3	**3.4**	**.81**	**.81**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 57							
Current K/A				**Revised K/A**			
				Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Under excitation.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.3	**3.4**	**.83**	**.78**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 58							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: motors.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.1	**3.2**	**.91**	**.92**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 59							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: breakers, relays.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.1	**3.3**	**.83**	**.83**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 60							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: double sequencing.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.6	**2.7**	**1.01**	**1.05**
Recommendation:	*Revise and obtain new ratings or else do not add to the Catalog due to large Standard Deviation.*						

New Degraded Voltage K/A 61							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Separation Criteria			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.0	**3.2**	**1.0**	**.99**
Recommendation:	*Revise and obtain new ratings or else do not add to the Catalog due to large Standard Deviation.*						

New Degraded Voltage K/A 62							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Reconnection Criteria.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.8	**3.1**	**.99**	**1.04**
Recommendation:	*Revise and obtain new ratings or else do not add to the Catalog due to large Standard Deviation.*						

New Degraded Voltage K/A 63							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Blackstart Criteria.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				2.9	**3.3**	**1.01**	**1.02**
Recommendation:	*Revise and obtain new ratings or else do not add to the Catalog due to large Standard Deviation.*						

New Degraded Voltage K/A 64							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Reactor and Turbine Trip Criteria.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.9	**4.2**	**.80**	**.74**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 65							
Current K/A				**Revised K/A**			
				Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Actions contained in AOP for Voltage and Grid disturbances.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**3.9**	**.72**	**.70**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 66							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**3.7**	**.79**	**.79**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 67							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Turbine/Generator controls.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.8	**3.7**	**.76**	**.76**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 68							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Voltage Regulator controls.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.8	**3.7**	**.76**	**.76**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 69							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Reactor controls.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				4.1	**4.1**	**.86**	**.85**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 70							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: Engineered safety features.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.9	**4.0**	**.82**	**.79**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 71							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operating point on the Generator capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.5	**3.6**	**.81**	**.82**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 72							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: VARS outside capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**3.6**	**.79**	**.82**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 73							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of offsite circuit.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.2	**3.8**	**.88**	**.89**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 74							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Generator frequency limitations.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.4	**3.5**	**.82**	**.83**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 75							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of engineered safety features.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**4.0**	**.86**	**.80**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 76							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Criteria to trip the turbine or reactor.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				4.3	**4.4**	**.73**	**.65**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 77							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Operational status of EDGs.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.9	**4.3**	**.72**	**.69**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 78							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Generator overheating and the required actions.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**3.8**	**.75**	**.74**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 79							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: sensors, detectors, indicators.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.0	**3.1**	**.85**	**.87**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 80							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: controllers and positioners.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.0	**3.0**	**.91**	**.90**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 81							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: pumps.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.1	**3.2**	**.90**	**.92**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 82							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Reactor Power.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.9	**4.0**	**.89**	**.87**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 83							
Current K/A				**Revised K/A**			
				Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Turbine/Generator control.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.6	**3.7**	**.83**	**.80**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 84							
Current K/A				**Revised K/A**			
				Ability to operate and/or monitor the following as apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage outside the generator capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.5	**3.6**	**.84**	**.85**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 85							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: Voltage outside the generator capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.5	**3.6**	**.81**	**.85**
Recommendation:	*Add to Catalog; E/APE section*						

New Degraded Voltage K/A 86							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as apply to the Generator Voltage and Electric Grid Disturbance: MVARS outside capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.4	**3.6**	**.80**	**.84**
Recommendation:		*Add to Catalog; E/APE section*					

New Degraded Voltage K/A 87							
Current K/A				**Revised K/A**			
				Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Generator Current outside the capability curve.			
First Survey Ratings		**First Survey SD**		**Second Survey Ratings**		**Second Survey SD**	
RO	**SRO**	**RO**	**SRO**	**RO**	**SRO**	**RO**	**SRO**
				3.5	**3.6**	**.84**	**.87**
Recommendation:		*Add to Catalog; E/APE section*					

ATTACHMENT 4: K/As with Standard Deviations Greater Than One with Comments from Participants

K/A 3: Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.
Re-Rate Survey: RO Impt: 2.9 SD 1.01 SRO Impt: 3.9 SD .82

Importance of RO to Master the K/A Comments:

- As a member of a shift crew, it is important for each operator to be aware of the requirements.
- The K/A talks about the SRO, but it is applicable to both the RO and the SRO. Should delete the phrase "of the SRO".
- Not RO task
- This is from a "guideline" currently provided by the NRC and placed in administrative procedures. The new NRC rulings will have a direct impact on these requirements. Due to these upcoming changes it is important to know these requirements.
- An RO should have the knowledge BUT the K/A is written as a SRO knowledge ONLY?

Importance of SRO to Master the K/A Comments:

- SRO should be very fluent in the use of procedures to ensure the minimum crew compliment is maintained - all within the law.
- The SRO is responsible to ensure that Tech. Spec. are met.
- must be aware of personnel fatigue and rest requirements
- This is from a "guideline currently provided by the NRC and placed in administrative procedures. The new NRC rulings will have a direct impact on these requirements. Due to these upcoming changes it is important to know these requirements.

K/A 4: Ability to manage the control room during plant transients.
Re-Rate Survey: RO Impt: 3.8 SD 1.06 SRO Impt: 4.8 SD .46

Importance of RO to Master the K/A Comments:

- RO needs to know how his actions affect the ability of the US to manage (i.e. not being distracting)
- As a shift crew member, it is essential for ROs to manage within the control room and direct EOs during plant transients to ensure safe operation.
- The word manage implies a supervisory function which would keep the rating low for an RO compared to an SRO.
- NOT an RO function.

- The RO needs to understand the correct interface/communication requirements to help this happen.

Importance of SRO to Master the K/A Comments:

- It is absolutely essential for SROs to master managing the control room during transients.
- Not just manage but to understand what is going on an anticipate needs for manning
- The SRO is the one that has to be able to orchestrate all the necessary activities to ensure a successful outcome.
- Not a good K/A for written examinations
- This is the meat of the SRO responsibility.

K/A 7: Knowledge of the station's requirements for verbal communications when implementing procedures.

Re-Rate Survey: RO Impt: 3.7 SD 1.01 SRO Impt: 3.8 SD .98

Importance of RO to Master the K/A Comments:

- The consequences of a misunderstood communication could be significant.
- By using the station approved communications standards error can be reduced when used properly.
- Not sure what you mean by this K/A, we have no specific requirement for this.
- Not a good exam K/A as this type of knowledge is GET type knowledge that is not specific to a licensed operator.

Importance of SRO to Master the K/A Comments:

- The consequences of a misunderstood communication could be significant.
- Internal & External notifications
- Not a good exam K/A as this type of knowledge is GET type knowledge that is not specific to a licensed operator.
- By using the station approved communications standards error can be reduced when used properly.
- It is essential that CR staff be able to communicate with each other and that everyone have the same understanding. However, in the end it is up to the receiver to ensure he understands the direction given. We have place to much focus on how to.

K/A 45: Ability to verify the controlled procedure copy.

Re-Rate Survey: RO Impt: 3.5 SD 1.03 SRO Impt: 3.6 SD 1.00

Importance of RO to Master the K/A Comments:

- too easy to mention
- GET

Importance of SRO to Master the K/A Comments:

- GET
- too easy to mention

K/A 60: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: double sequencing.
Re-Rate Survey: RO Impt: 2.6 SD 1.01 SRO Impt: 2.7 SD 1.05

Importance of RO to Master the K/A Comments:

- Don't understand double sequencing, what is this??? With a better definition, might could relate to job.
- Operator has no control
- Have not heard of "double sequencing"
- This sounds important, but I am not familiar with the term 'double sequencing'
- I never heard of Double Sequencing
- I am not familiar with the term double sequencing.
- Not familiar with term 'double sequencing'
- don't understand the term
- I don't know what is meant by "double sequencing"
- ?
- do not recognize this term ?
- double sequencing?????
- Not familiar with the term "double sequencing"
- I am not familiar with the term double sequencing.
- not sure of what this is
- Double sequencing is not a term which we use. A second automatic SI signal is not a feature of our plant design. Our EOPs contain cautions which direct manual (re)actuation of SI after termination or reduction should conditions deteriorate.
- is this term new or a geographical "slang" I asked several licensed operators and we have not used this term in relation to grid stability or generator control at our unit!

Importance of SRO to Master the K/A Comments:

- ??
- do not recognize this term ?
- double sequencing?????
- not sure of what this is
- What is "double sequencing"?

- This sounds important, but I am not familiar with the term 'double sequencing'
- I never heard of the term, and can find little info on the internet. Therefore, I doubt it is important.
- I am not familiar with the term double sequencing.
- Not familiar with term 'double sequencing'
- Don't understand double sequencing, what is this??? With a better definition, might could relate to job.
- Have not heard of "double sequencing"
- don't understand the term
- Not familiar with the term "double sequencing"

K/A 61: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Separation Criteria

Re-Rate Survey: RO Impt: 3.0 SD 1.0 SRO Impt: 3.2 SD .99

Importance of RO to Master the K/A Comments:

- I am not familiar with the concept of Grid Separation Criteria.
- These terms must be associated with localized blackouts, which we have not experienced
- NA for LGS Ops

Importance of SRO to Master the K/A Comments:

- Seems to be topic beyond SRO and maybe corporate type management function
- "grid separation criteria" gets no hits on Google. Is this a common term?
- I am not familiar with the concept of Grid Separation Criteria.

K/A 62: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Reconnection Criteria.

Re-Rate Survey: RO Impt: 2.8 SD .99 SRO Impt: 3.1 SD 1.04

Importance of RO to Master the K/A Comments:

- I am not familiar with the concept of Grid Reconnection Criteria.
- NA at for LGS Ops
- generalization not possible, will be scenario specific

Importance of SRO to Master the K/A Comments:

- generalization not possible, will be scenario specific
- Seems to be topic beyond SRO and maybe corporate type management function
- I am not familiar with the concept of Grid Reconnection Criteria.

K/A 63: Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Blackstart Criteria.
Re-Rate Survey: RO Impt: 2.9 SD 1.01 SRO Impt: 3.3 SD 1.02

Importance of RO to Master the K/A Comments:

- The nuclear plant does not have black start criteria since RCPs and other important secondary motors are NOT powered other than from grid provided sources.
- I am not familiar with the concept of Blackstart Criteria.
- if black, then start
- Probably not allowed by TS

Importance of SRO to Master the K/A Comments:

- if black, then start
- What is "blackstart criteria"?
- I am not familiar with the concept of Blackstart Criteria.

ATTACHMENT 5: Comments from Participants for all K/As

1. **Knowledge of shift or short-term relief turnover practices.**
   Re-Rate Survey: RO Impt: 3.7 SD .97 SRO Impt: 3.9 SD .90

   Importance of RO to Master the K/A Comments:
   - Complete and thorough turnovers are essential for ensuring safe plant operations as equipment status can and does change.
   - This skill is useful for short term issues that will impact the oncoming operator, but issues that would be resolved over days is not as important.
   - Based on specific plant conditions that impact operation and equipment reliability. This is focused only on the relevant changes that would impact system operation or component manipulation.
   - Operator work around
   - The importance is to know a turnover is required, the direct impact on the health and safety of the public is not impacted.
   - It is more important to have ensure a good turnover of information.

   Importance of SRO to Master the K/A Comments:
   - Again focused on the work control aspects of the job and less so on operability and Tech Spec issues.
   - Complete and thorough turnovers are essential for ensuring safe plant operations as equipment status can and does change.
   - I assumed this question is looking at what needs to be turned over not how.
   - The SRO should be the one resolving the issues.
   - The importance is to know a turnover is required, the direct impact on the health and safety of the public is not impacted.
   - It is more important to have ensure a good turnover of information.

2. **Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.**
   Re-Rate Survey: RO Impt: 3.3 SD .96 SRO Impt: 3.8 SD .87

   Importance of RO to Master the K/A Comments:
   - It is important for operators to be cognizant of and abide by the law. The law is the minimum requirement for safe operation.
   - The RO should be aware that if they have any medical changes they need to report them.
   - Plant administrative procedures adequately address these aspects.

- These definitions are provided by the NRC but are being changed pertaining to "no-solo" operation. What needs to be a K/A is how to find and understand the most current requirements.

Importance of SRO to Master the K/A Comments:

- The SRO is responsible to ensure that Tec. Spec. are complied with so they should be aware of the operators license restriction.
- These definitions are provided by the NRC but are being changed pertaining to "no-solo" operation. What needs to be a K/A is how to find and understand the most current requirements.
- Focusing on plant staffing and manning with work hour limitations and work control.
- Not as important if an administrative staff person ensures these requirements are met.
- It is essential for Senior Operators to master this K/A - to ensure shift staffing is at the minimum for safe operation.

3. **Ability of the SRO to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.**
Re-Rate Survey: RO Impt: 2.9 SD 1.01 SRO Impt: 3.9 SD .82

Importance of RO to Master the K/A Comments:

- As a member of a shift crew, it is important for each operator to be aware of the requirements.
- The K/A talks about the SRO, but it is applicable to both the RO and the SRO. Should delete the phrase "of the SRO".
- Not RO task
- This is from a "guideline" currently provided by the NRC and placed in administrative procedures. The new NRC rulings will have a direct impact on these requirements. Due to these upcoming changes it is important to know these requirements.
- An RO should have the knowledge BUT the K/A is written as a SRO knowledge ONLY?

Importance of SRO to Master the K/A Comments:

- SRO should be very fluent in the use of procedures to ensure the minimum crew compliment is maintained - all within the law.
- The SRO is responsible to ensure that Tech. Spec. are met.
- must be aware of personnel fatigue and rest requirements
- This is from a "guideline currently provided by the NRC and placed in administrative procedures. The new NRC rulings will have a direct impact on these requirements. Due to these upcoming changes it is important to know these requirements.

4. **Ability to manage the control room during plant transients.**
Re-Rate Survey: RO Impt: 3.8 SD 1.06 SRO Impt: 4.8 SD .46

Importance of RO to Master the K/A Comments:

- RO needs to know how his actions affect the ability of the US to manage (i.e. not being distracting)
- As a shift crew member, it is essential for ROs to manage within the control room and direct EOs during plant transients to ensure safe operation.
- The word manage implies a supervisory function which would keep the rating low for an RO compared to an SRO.
- NOT an RO function.
- The RO needs to understand the correct interface/communication requirements to help this happen.

Importance of SRO to Master the K/A Comments:

- It is absolutely essential for SROs to master managing the control room during transients.
- Not just manage but to understand what is going on an anticipate needs for manning
- The SRO is the one that has to be able to orchestrate all the necessary activities to ensure a successful outcome.
- Not a good K/A for written examinations
- This is the meat of the SRO responsibility.

5. Knowledge of the criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.
Re-Rate Survey: RO Impt: 3.1 SD .95 SRO Impt: 3.1 SD .96

Importance of RO to Master the K/A Comments:

- This is more of an INPO hit than a necessity.
- Changing plant conditions is good information but no direct affect on health and safety.

Importance of SRO to Master the K/A Comments:

- Changing plant conditions is good information but no direct affect on health and safety.
- The consequences on not announcing a pump start or mode change are usually "none."
- The industry is currently struggling with being over burden by administrative tasks. Informing the plant staff is need but it should not be looked as important. In most cases PA's do little good for those you need to communicate with.
- This is more of an INPO hit than a necessity.
- Good Practice

6. **Knowledge of administrative requirements for implementing temporary management directives, such as standing orders, night orders, Operations memos, etc.**
Re-Rate Survey: RO Impt: 2.7 SD .79 SRO Impt: 3.4 SD .80

Importance of RO to Master the K/A Comments:
- Standing orders often address important, current issues, and must be understood.
- Management's wishes are usually big to them and if you don't do them there are generally no plant caused issues only hurt egos.

Importance of SRO to Master the K/A Comments:
- Management's wishes are usually big to them and if you don't do them there are generally no plant caused issues only hurt egos.

7. **Knowledge of the station's requirements for verbal communications when implementing procedures.**
Re-Rate Survey: RO Impt: 3.7 SD 1.01 SRO Impt: 3.8 SD .98

Importance of RO to Master the K/A Comments:
- The consequences of a misunderstood communication could be significant.
- By using the station approved communications standards error can be reduced when used properly.
- Not sure what you mean by this K/A, we have no specific requirement for this.
- Not a good exam K/A as this type of knowledge is GET type knowledge that is not specific to a licensed operator.

Importance of SRO to Master the K/A Comments:
- The consequences of a misunderstood communication could be significant.
- Internal & External notifications
- Not a good exam K/A as this type of knowledge is GET type knowledge that is not specific to a licensed operator.
- By using the station approved communications standards error can be reduced when used properly.
- It is essential that CR staff be able to communicate with each other and that everyone have the same understanding. However, in the end it is up to the receiver to ensure he understands the direction given. We have place to much focus on how to.

8. **Ability to use plant computers to evaluate system or component status.**
Re-Rate Survey: RO Impt: 3.9 SD .79 SRO Impt: 3.8 SD .78

Importance of RO to Master the K/A Comments:

- Our station has an extensive computer system that monitors many more parameters than those shown on the control boards.
- The computers can shows signs of equipment problems early and can also allow the RO to monitor remote indications when no field personnel are available.
- As long as there is no delays created by trying to evaluate to much information.
- Not a good written exam K/A but ok for operating test

Importance of SRO to Master the K/A Comments:

- Our station has an extensive computer system that monitors many more parameters than those shown on the control boards.
- Not a good written exam K/A but ok for operating test

9. Ability to interpret reference materials, such as graphs, curves, tables, etc.
Re-Rate Survey: RO Impt: 3.9 SD .75 SRO Impt: 4.2 SD .69

Importance of RO to Master the K/A Comments:

- Misinterpretation of information from graphs can be costly and unsafe.

Importance of SRO to Master the K/A Comments:

- EOP decisions are sometimes made from graphs and curves.

10. Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.
Re-Rate Survey: RO Impt: 4.1 SD .79 SRO Impt: 4.0 SD .80

Importance of RO to Master the K/A Comments:

- Non Licensed operator knowledge

Importance of SRO to Master the K/A Comments:

- Non Licensed operator knowledge
- Somewhat less important than RO, if the SRO relies on the RO for the details of the lineup.
- Over the last 20 years this has become a weakness. Today when someone says we need to get back to basic to many folks thinks that means 3-way communication. It should mean getting plant operation right the first time.

11. Knowledge of primary and secondary plant chemistry limits.
Re-Rate Survey: RO Impt: 2.7 SD .77 SRO Impt: 3.5 SD .84

Importance of RO to Master the K/A Comments:

- Since most sites have procedures that require certain action when different chemistry parameters are exceeded, it is not vital for the operators have memorized what chemistry parameters.

- Chemistry Techs have detailed knowledge, and help Operations in this area.
- Chemistry tracks
- additionally how they can be affected by various system failures.

Importance of SRO to Master the K/A Comments:

- recognize significance of discussions with shift chemist if action levels are approached or exceeded.
- Technical Specification
- additionally how they can be affected by various system failures.
- Chemistry tracks
- Needed for back ground so the operators will know why. Most of what goes on with chemistry is an on going experiment and a lot of knowledge just means time that could be used else where is lost.
- Since most sites have procedures that require certain action when different chemistry parameters are exceeded, it is not vital for the operators have memorized what chemistry parameters.

12. Knowledge of the fuel-handling responsibilities of SROs.
Re-Rate Survey: RO Impt: 2.2 SD .94 SRO Impt: 3.9 SD .83

Importance of RO to Master the K/A Comments:

- we use dedicated extra trained operators to move fuel
- NA

Importance of SRO to Master the K/A Comments:

- may not be applicable per plant specific task list
- Briefed prior to movement
- Seems that we now limit the ReFuel SRO duties to a limited number of individuals so the importance to the general SRO population is probably in the Fairly Important Range. For the individuals performing the function I would score it as essential.
- Fuel handling must be performed with great accuracy.
- Essential to the refueling, SRO and Important to the CR command function
- ONLY if performing fuel-handling duties
- we use dedicated extra trained operators to move fuel

13. Knowledge of procedures and limitations involved in core alterations.
Re-Rate Survey: RO Impt: 3.0 SD .92 SRO Impt: 4.1 SD .73

Importance of RO to Master the K/A Comments:

- we use dedicated extra trained operators to move fuel
- NA

Importance of SRO to Master the K/A Comments:

- Seems that we now limit the ReFuel SRO duties to a limited number of individuals so the importance to the general SRO population is probably in the Fairly Important Range. For the individuals performing the function I would score it as essential.
- ONLY if supervising core alterations
- we use dedicated extra trained operators to move fuel

14. Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc.
Re-Rate Survey: RO Impt: 4.1 SD .89 SRO Impt: 4.3 SD .77

Importance of RO to Master the K/A Comments:

- Reactivity is the #1 priority of all licensed operators; they have to be able to determine the effects of plant status changes on the reactivity.
- Procedures, or theory?
- I wouldn't even know how to apply this K/A to real world from a procedure application
- This is fundamental knowledge not procedurally driven. The knowledge of this function is needed.

Importance of SRO to Master the K/A Comments:

- Reactivity is the #1 priority of all licensed operators; they have to be able to determine the effects of plant status changes on the reactivity.
- I wouldn't even know how to apply this K/A to real world from a procedure application
- This is fundamental knowledge not procedurally driven. The knowledge of this function is needed.

15. Knowledge of procedures, guidelines, or limitations associated with reactivity management.
Re-Rate Survey: RO Impt: 4.3 SD .70 SRO Impt: 4.6 SD .53

16. Knowledge of the process for making design or operating changes to the facility.
Re-Rate Survey: RO Impt: 2.2 SD .73 SRO Impt: 3.2 SD .82

Importance of RO to Master the K/A Comments:

- Most design changes are a long-term evolution and have plenty of checks & balances in them. The operators need to be involved in the planning phase and implementation phase. But they do not need to have detailed knowledge of how the process works.
- Should separate "design" from "operating"

- Administratively controlled engineering process with practically no impact on an operator.

Importance of SRO to Master the K/A Comments:

- Most design changes are a long-term evolution and have plenty of checks & balances in them. The operators need to be involved in the planning phase and implementation phase. But they do not need to have detailed knowledge of how the process works.
- Staff personnel help with these changes.
- Caveat is there must be a compelling need to know why changes are necessary, not how to implement the process of making a change.
- Administratively controlled engineering process with practically no impact on an operator.
- Ensuring the 50.59 criteria are met and understanding that the authorization for these changes need to be based on experience and plant knowledge.

17. Knowledge of the process for making changes to procedures.
Re-Rate Survey: RO Impt: 3.0 SD .84 SRO Impt: 3.6 SD .78

Importance of RO to Master the K/A Comments:

- The operators need to be involved in the initiation of procedure change and the review of the changes. But they do not need to have detailed knowledge of how the process works.
- RO's typically do not draft procedure changes at our station.

Importance of SRO to Master the K/A Comments:

- The operators need to be involved in the initiation of procedure change and the review of the changes. But they do not need to have detailed knowledge of how the process works.

18. Knowledge of the process for conducting special or infrequent tests.
Re-Rate Survey: RO Impt: 2.9 SD .84 SRO Impt: 3.6 SD .76

Importance of RO to Master the K/A Comments:

- These types of tests are governed by procedures and NRC requirements. Operators need to be involved in the initiation of test development and the review of the final test. But they do not need to have detailed knowledge of how the process works.

Importance of SRO to Master the K/A Comments:

- The process needs to be understood.
- A designated manager should assist the SRO in implementing this process.
- These types of tests are governed by procedures and NRC requirements. Operators need to be involved in the initiation of test development and the

review of the final test. But they do not need to have detailed knowledge of how the process works.

19. Knowledge of the process for controlling temporary design changes.
Re-Rate Survey: RO Impt: 2.3 SD .70 SRO Impt: 3.3 SD .80

Importance of RO to Master the K/A Comments:

- Don't need to know the process as much as what constitutes a temporary change.
- Engineering process

Importance of SRO to Master the K/A Comments:

- same comments as modifications.
- Engineering process
- As far as ensuring relevant controlled documents are maintained current.
- Don't need to know the process as much as what constitutes a temporary change. Then, Engineering needs to implement the process.

20. Knowledge of the process for controlling equipment configuration or status.
Re-Rate Survey: RO Impt: 3.9 SD .75 SRO Impt: 4.3 SD .66

21. Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, lineups, tag-outs, etc.
Re-Rate Survey: RO Impt: 3.9 SD .74 SRO Impt: 4.3 SD .68

Importance of RO to Master the K/A Comments:

- "expected" for what?

Importance of SRO to Master the K/A Comments:

- "expected" for what?

22. Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, etc.
Re-Rate Survey: RO Impt: 2.5 SD .74 SRO Impt: 4.0 SD .72

Importance of RO to Master the K/A Comments:

- SROs usually manage this aspect at our station.

23. Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.
Re-Rate Survey: RO Impt: 2.6 SD .80 SRO Impt: 3.9 SD .74

24. Ability to track Technical Specification limiting conditions for operations.
Re-Rate Survey: RO Impt: 3.1 SD .87 SRO Impt: 4.6 SD .53

25. Ability to determine Technical Specification Mode of Operation.
Re-Rate Survey: RO Impt: 3.6 SD .85 SRO Impt: 4.5 SD .69

Importance of RO to Master the K/A Comments:

- Although important, from a testing standpoint, level of Difficulty 1, it's a no-brainer K/A

Importance of SRO to Master the K/A Comments:

- Although important, from a testing standpoint, level of Difficulty 1, it's a no-brainer K/A
- Focusing on what constitutes Modes of operation and making Mode changes.

26. Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.
Re-Rate Survey: RO Impt: 3.2 SD .95 SRO Impt: 3.7 SD .82

Importance of RO to Master the K/A Comments:

- GET

Importance of SRO to Master the K/A Comments:

- GET

27. Knowledge of Radiological Safety Procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high radiation areas, aligning filters, etc.
Re-Rate Survey: RO Impt: 3.4 SD .91 SRO Impt: 3.8 SD .81

Importance of RO to Master the K/A Comments:

- Rad Protection job, limited licensed operator impact
- same K/A as previous.

Importance of SRO to Master the K/A Comments:

- Rad Protection job, limited licensed operator impact
- same K/A as previous.

28. Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.
Re-Rate Survey: RO Impt: 3.4 SD .78 SRO Impt: 3.8 SD .75

29. Knowledge of radiation exposure limits under normal or emergency conditions.
Re-Rate Survey: RO Impt: 3.2 SD .89 SRO Impt: 3.7 SD .83

Importance of SRO to Master the K/A Comments:

- HP assisted
- NLOs and Rad Protection provide assistance in this area. Hence, RO and SRO are not the last line of defense. This is my reason for not stating it is essential.

30. Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
Re-Rate Survey: RO Impt: 2.9 SD .89 SRO Impt: 3.1 SD .81

Importance of RO to Master the K/A Comments:

- Plant access info GET
- Fixed radiation monitors - very important. Personnel and portable monitors - not very important.
- GET

Importance of SRO to Master the K/A Comments:

- GET
- Plant access info GET

31. Ability to approve release permits.
Re-Rate Survey: RO Impt: 2.0 SD .89 SRO Impt: 3.8 SD .93

Importance of RO to Master the K/A Comments:

- ROs do not approve release permits. It is important for an RO to understand the organization of the permit and to fundamentally understand the radiological activity information presented.
- N/A

Importance of SRO to Master the K/A Comments:

- Not a control room duty where I work

32. Ability to comply with radiation work permit requirements during normal or abnormal conditions.
Re-Rate Survey: RO Impt: 3.5 SD .98 SRO Impt: 3.6 SD .91

Importance of RO to Master the K/A Comments:

- again GET info
- Only when personally accessing those areas
- GET

Importance of SRO to Master the K/A Comments:

- Only when personally accessing those areas
- NLOs need this skill.

- GET
- again GET info

33. Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
Re-Rate Survey: RO Impt: 2.9 SD .98 SRO Impt: 2.9 SD .98

Importance of RO to Master the K/A Comments:
- GET
- Exit using PCM-1/-2; Rad. Prot. departments perform ALL other items.
- Not a licensed operator job function
- Fixed Only

Importance of SRO to Master the K/A Comments:
- Not a licensed operator job function
- GET
- Fixed Only
- Exit using PCM-1/-2; Rad. Prot. departments perform ALL other items.

34. Knowledge of EOP mitigation strategies.
Re-Rate Survey: RO Impt: 3.7 SD .72 SRO Impt: 4.7 SD .47

35. Knowledge of how abnormal operating procedures are used in conjunction with EOPs.
Re-Rate Survey: RO Impt: 3.8 SD .72 SRO Impt: 4.5 SD .65

Importance of RO to Master the K/A Comments:
- Bad written exam K/A, non discriminating

Importance of SRO to Master the K/A Comments:
- Bad written exam K/A, non discriminating

36. Knowledge of crew roles and responsibilities during EOP usage.
Re-Rate Survey: RO Impt: 4.0 SD .82 SRO Impt: 4.6 SD .62

Importance of RO to Master the K/A Comments:
- Bad written exam K/A, non discriminating

Importance of SRO to Master the K/A Comments:
- Bad written exam K/A, non discriminating

37. Knowledge of general guidelines for EOP usage.
Re-Rate Survey: RO Impt: 3.8 SD .78 SRO Impt: 4.5 SD .59

Importance of SRO to Master the K/A Comments:

- assuming this is different from 36

38. Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.
Re-Rate Survey: RO Impt: 4.0 SD .85 SRO Impt: 4.6 SD .60

Importance of RO to Master the K/A Comments:
- Sounds like SPDS, a system K/A, not a very good generic K/A

Importance of SRO to Master the K/A Comments:
- Sounds like SPDS, a system K/A, not a very good generic K/A
- done with procedure or computer

39. Knowledge of procedures relating to a security event.
Re-Rate Survey: RO Impt: 3.2 SD .80 SRO Impt: 4.1 SD .74

Importance of SRO to Master the K/A Comments:
- only operations impact for RO

40. Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies.
Re-Rate Survey: RO Impt: 2.6 SD .86 SRO Impt: 4.1 SD .74

41. Knowledge of annunciator alarms, indications, or response procedures.
Re-Rate Survey: RO Impt: 4.2 SD .65 SRO Impt: 4.1 SD .71

Importance of RO to Master the K/A Comments:
- using procedures, not from memory
- Answered this as a 2.0 due to the availability of the procedures to the Operators (no need for rote memorization). If the question is asking about the ability to 'use' the procedures, then my answer would be 4.0 for RO's
- Specific system K/A not appropriate as a generic K/A, but certainly important, although there are 1000 alarms and indications things this could apply to.

Importance of SRO to Master the K/A Comments:
- using procedures, not from memory
- Specific system K/A not appropriate as a generic K/A, but certainly important, although there are 1000 alarms and indications things this could apply to.

42. Knowledge of RO tasks that are performed outside the main control room during an emergency and the resulting operational effects.

Re-Rate Survey: RO Impt: 4.2 SD .69 SRO Impt: 4.1 SD .70

Importance of RO to Master the K/A Comments:

- minimal RO tasks outside the MCR during an emergency.

Importance of SRO to Master the K/A Comments:

- minimal RO tasks outside the MCR during an emergency.

43. Knowledge of local auxiliary operator tasks during an emergency and the resulting operational effects.
Re-Rate Survey: RO Impt: 3.8 SD .74 SRO Impt: 4.0 SD .72

Importance of RO to Master the K/A Comments:

- Depends on who directly interfaces with AOs. My answers assume the direction comes from SROs.

44. Knowledge of the lines of authority during implementation of the emergency plan.
Re-Rate Survey: RO Impt: 3.0 SD .99 SRO Impt: 4.1 SD .72

Importance of RO to Master the K/A Comments:

- not directly involved with TSC/EOF interfaces
- still the shift supervisor for them

45. Ability to verify the controlled procedure copy.
Re-Rate Survey: RO Impt: 3.5 SD 1.03 SRO Impt: 3.6 SD 1.00

Importance of RO to Master the K/A Comments:

- too easy to mention
- GET

Importance of SRO to Master the K/A Comments:

- GET
- too easy to mention

46. Ability to control radiation releases.
Re-Rate Survey: RO Impt: 3.8 SD .91 SRO Impt: 4.3 SD .78

Importance of RO to Master the K/A Comments:

- This is very ambiguous. This should just be covered by K/As associated with procedure use. Procedures should exist to cover these conditions. Better K/A would be ability to use procedures to control radiation releases.

Importance of SRO to Master the K/A Comments:

- This is very ambiguous. This should just be covered by K/As associated with procedure use. Procedures should exist to cover these conditions. Better K/A would be ability to use procedures to control radiation releases.

47. Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.
Re-Rate Survey: RO Impt: 2.6 SD .82 SRO Impt: 3.8 SD .75

Importance of SRO to Master the K/A Comments:
- mainly done by off-shift support staff

48. Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.
Re-Rate Survey: RO Impt: 3.1 SD .81 SRO Impt: 4.2 SD .70

Importance of SRO to Master the K/A Comments:
- It is essential that the SRO know enough to get other involved.

49. Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the state, the NRC, or the transmission system operator.
Re-Rate Survey: RO Impt: 2.7 SD .84 SRO Impt: 4.1 SD .70

Importance of RO to Master the K/A Comments:
- General Understanding Only

Importance of SRO to Master the K/A Comments:
- State-No, NRC-Yes, TSO-it is important that we both talk the same language, standardization of information is very important.
- fundamentals GFE

50. Knowledge of site corrosion processes, such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.
Re-Rate Survey: RO Impt: 2.6 SD .89 SRO Impt: 3.1 SD .89

Importance of RO to Master the K/A Comments:
- Don't need detailed scientific knowledge, but need to know they can occur.
- fundamentals GFE

Importance of SRO to Master the K/A Comments:
- Others in organization help monitor in these areas.
- BWRs only use clean water

51. Knowledge of water chemistry controls, such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.
Re-Rate Survey: RO Impt: 2.9 SD .82 SRO Impt: 3.5 SD .82

Importance of RO to Master the K/A Comments:

- by procedure

Importance of SRO to Master the K/A Comments:

- Only in terms of impact on release.
- I presume primary responsibility is with an on-shift chemist. If no on-shift chemist then this would be very important for the SRO.
- Although important, how you write questions for this one? Not a very good generic K/A
- by procedure

52. Knowledge of conservative decision making practices.
Re-Rate Survey: RO Impt: 3.6 SD .89 SRO Impt: 4.3 SD .79

Importance of RO to Master the K/A Comments:

- Although important, how you write questions for this one? Not a very good generic K/A
- I don't know how this will be measurable in an examination environment. It will be used as a subjective judgment associated with performance.

Importance of SRO to Master the K/A Comments:

- Conservative decision making is not something that one masters on a written test nor can it be gauged on simulator examinations or JPMs, while the idea of CDM is a very important concept, there is no metrics that can delineate competency, RO/SRO
- I don't know how this will be measurable in an examination environment. It will be used as a subjective judgment associated with performance.
- I would find it impossible to write a question for this K/A unless it pulled the answer directly out of some procedure. But, then how do you write three plausible distracters. I don't really think this one should be in the book.
- Fundamental

53. Ability to identify and interpret diverse indications to validate the response of another indicator.
Re-Rate Survey: RO Impt: 4.3 SD .68 SRO Impt: 4.3 SD .67

Importance of RO to Master the K/A Comments:

- Fundamental

54. Ability to determine operability and/or availability of safety related equipment.
Re-Rate Survey: RO Impt: 3.6 SD .74 SRO Impt: 4.6 SD .53

Importance of RO to Master the K/A Comments:

- Availability

Importance of SRO to Master the K/A Comments:
- usually clear cut or lots of help
- many time this requires engineering support

55. Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Definition of terms: volts, watts, amps, vars, power factor.
Re-Rate Survey: RO Impt: 3.3 SD .95 SRO Impt: 3.5 SD .97

Importance of RO to Master the K/A Comments:
- Non licensed operator and GFE knowledge
- impact, not definitions

Importance of SRO to Master the K/A Comments:
- impact, not definitions
- Non licensed operator and GFE knowledge
- Another one that should be covered on the GFES exam.

56. Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Over excitation.
Re-Rate Survey: RO Impt: 3.3 SD .81 SRO Impt: 3.4 SD .81

Importance of RO to Master the K/A Comments:
- not worth it's own K/A, same as 55
- System specific knowledge, generator or distribution BAD generic

Importance of SRO to Master the K/A Comments:
- not worth it's own K/A, same as 55
- System specific knowledge, generator or distribution BAD generic

57. Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Under excitation.
Re-Rate Survey: RO Impt: 3.3 SD .83 SRO Impt: 3.4 SD .78

Importance of RO to Master the K/A Comments:
- not worth it's own K/A, same as 55

- System specific knowledge, generator or distribution BAD generic

Importance of SRO to Master the K/A Comments:
- not worth it's own K/A, same as 55
- System specific knowledge, generator or distribution BAD generic

58. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: motors.
Re-Rate Survey: RO Impt: 3.1 SD .91 SRO Impt: 3.2 SD .92

Importance of RO to Master the K/A Comments:
- not worth it's own K/A, same as 55
- System specific knowledge, generator or distribution BAD generic

Importance of SRO to Master the K/A Comments:
- not worth it's own K/A, same as 55
- System specific knowledge, generator or distribution BAD generic

59. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: breakers, relays.
Re-Rate Survey: RO Impt: 3.1 SD .83 SRO Impt: 3.3 SD .83

Importance of RO to Master the K/A Comments:
- knowledge of components essential, but on interrelations, you either trip or not.
- System specific knowledge, generator or distribution BAD generic
- Operator would have no control over these.

Importance of SRO to Master the K/A Comments:
- knowledge of components essential, but on interrelations, you either trip or not.
- SRO needs to understand when these are supposed to actuate
- System specific knowledge, generator or distribution BAD generic

60. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: double sequencing.
Re-Rate Survey: RO Impt: 2.6 SD 1.01 SRO Impt: 2.7 SD 1.05

Importance of RO to Master the K/A Comments:
- Don't understand double sequencing, what is this??? With a better definition, might could relate to job.
- Operator has no control
- Have not heard of "double sequencing"
- This sounds important, but I am not familiar with the term 'double sequencing'

- I never heard of Double Sequencing
- I am not familiar with the term double sequencing.
- Not familiar with term 'double sequencing'
- don't understand the term
- I don't know what is meant by "double sequencing"
- ?
- do not recognize this term ?
- double sequencing?????
- Not familiar with the term "double sequencing"
- I am not familiar with the term double sequencing.
- not sure of what this is
- Double sequencing is not a term which we use. A second automatic SI signal is not a feature of our plant design. Our EOPs contain cautions which direct manual (re)actuation of SI after termination or reduction should conditions deteriorate.
- is this term new or a geographical "slang" I asked several licensed operators and we have not used this term in relation to grid stability or generator control at our unit!

Importance of SRO to Master the K/A Comments:

- ??
- do not recognize this term ?
- double sequencing?????
- not sure of what this is
- What is "double sequencing"?
- This sounds important, but I am not familiar with the term 'double sequencing'
- I never heard of the term, and can find little info on the internet. Therefore, I doubt it is important.
- I am not familiar with the term double sequencing.
- Not familiar with term 'double sequencing'
- Don't understand double sequencing, what is this??? With a better definition, might could relate to job.
- Have not heard of "double sequencing"
- don't understand the term
- Not familiar with the term "double sequencing"

61. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Separation Criteria
Re-Rate Survey: RO Impt: 3.0 SD 1.0 SRO Impt: 3.2 SD .99

Importance of RO to Master the K/A Comments:

- I am not familiar with the concept of Grid Separation Criteria.

- These terms must be associated with localized blackouts, which we have not experienced
- NA for LGS Ops

Importance of SRO to Master the K/A Comments:

- Seems to be topic beyond SRO and maybe corporate type management function
- "grid separation criteria" gets no hits on Google. Is this a common term?
- I am not familiar with the concept of Grid Separation Criteria.

62. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Grid Reconnection Criteria.
Re-Rate Survey: RO Impt: 2.8 SD .99 SRO Impt: 3.1 SD 1.04

Importance of RO to Master the K/A Comments:

- I am not familiar with the concept of Grid Reconnection Criteria.
- NA at for LGS Ops
- generalization not possible, will be scenario specific

Importance of SRO to Master the K/A Comments:

- generalization not possible, will be scenario specific
- Seems to be topic beyond SRO and maybe corporate type management function
- I am not familiar with the concept of Grid Reconnection Criteria.

63. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Blackstart Criteria.
Re-Rate Survey: RO Impt: 2.9 SD 1.01 SRO Impt: 3.3 SD 1.02

Importance of RO to Master the K/A Comments:

- The nuclear plant does not have black start criteria since RCPs and other important secondary motors are NOT powered other than from grid provided sources.
- I am not familiar with the concept of Blackstart Criteria.
- if black, then start
- Probably not allowed by TS

Importance of SRO to Master the K/A Comments:

- if black, then start
- What is "blackstart criteria"?
- I am not familiar with the concept of Blackstart Criteria.

64. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Reactor and Turbine Trip Criteria.
Re-Rate Survey: RO Impt: 3.9 SD .80 SRO Impt: 4.2 SD .74

Importance of RO to Master the K/A Comments:

- but simple per procedures

Importance of SRO to Master the K/A Comments:

- but simple per procedures

65. Knowledge of the reasons for the following responses as they apply to the Generator Voltage and Electric Grid Disturbances: Actions contained in AOP for Voltage and Grid disturbances.
Re-Rate Survey: RO Impt: 3.6 SD .72 SRO Impt: 3.9 SD .70

Importance of RO to Master the K/A Comments:

- this is what really counts for 56-64
- Actions which are of primary importance are contained in Annunciator Response Procedures which monitor for required separation from the grid via Degraded Bus Voltage.

Importance of SRO to Master the K/A Comments:

- this is what really counts for 56-64
- Should this be in the emergency and abnormal event section?

66. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage.
Re-Rate Survey: RO Impt: 3.6 SD .79 SRO Impt: 3.7 SD .79

Importance of RO to Master the K/A Comments:

- not sure how we operate grid freq/volt

67. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: Turbine/Generator controls.
Re-Rate Survey: RO Impt: 3.8 SD .76 SRO Impt: 3.7 SD .76

68. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: Voltage Regulator controls.
Re-Rate Survey: RO Impt: 3.8 SD .76 SRO Impt: 3.7 SD .76

Importance of RO to Master the K/A Comments:

- same as 67

Importance of SRO to Master the K/A Comments:

- same as 67

69. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: Reactor controls.
Re-Rate Survey: RO Impt: 4.1 SD .86 SRO Impt: 4.1 SD .85

Importance of RO to Master the K/A Comments:

- Expect to either be on or off.
- This is a rare and unusual situation covered by procedures
- reactor operation here too simple for its own K/A. Trip/reduce power/ or nothing.

Importance of SRO to Master the K/A Comments:

- Important, but covered by procedure and does not need to be committed to memory
- Needs to understand when controls become unreliable
- reactor operation here too simple for its own K/A. Trip/reduce power/ or nothing.

70. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: Engineered safety features.
Re-Rate Survey: RO Impt: 3.9 SD .82 SRO Impt: 4.0 SD .79

Importance of RO to Master the K/A Comments:

- EDGs will take over as necessary
- if anything was suppose to happen, it should have automatically. If not alarm will tell you.

Importance of SRO to Master the K/A Comments:

- Need to understand when off site power is unreliable
- if anything was suppose to happen, it should have automatically. If not alarm will tell you.

71. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Operating point on the Generator capability.
Re-Rate Survey: RO Impt: 3.5 SD .81 SRO Impt: 3.6 SD .82

Importance of RO to Master the K/A Comments:

- Know where to find it

Importance of SRO to Master the K/A Comments:

- know where to find it
- handled by RO using a curve

72. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: VARS outside capability curve.
Re-Rate Survey: RO Impt: 3.6 SD .79 SRO Impt: 3.6 SD .82

Importance of RO to Master the K/A Comments:

- know where to find it
- same as 71

Importance of SRO to Master the K/A Comments:

- know where to find it
- Done by RO using a curve
- same as 71

73. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Operational status of offsite circuit operability.
Re-Rate Survey: RO Impt: 3.2 SD .88 SRO Impt: 3.8 SD .89

Importance of SRO to Master the K/A Comments:

- Limited to TSO communications and existing guidance on plant operating limits and effects on offsite power availability

74. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Generator frequency limitations.
Re-Rate Survey: RO Impt: 3.4 SD .82 SRO Impt: 3.5 SD .83

Importance of RO to Master the K/A Comments:

- know where to find it
- if it is a problem, you tripped. Operator will not be fast enough to make a difference.

Importance of SRO to Master the K/A Comments:

- know where to find it
- if it is a problem, you tripped. Operator will not be fast enough to make a difference.
- Protective relays should prevent operation in harmful areas, and should not depend on operator actions.

75. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Operational status of engineered safety features.
Re-Rate Survey: RO Impt: 3.6 SD .86 SRO Impt: 4.0 SD .80

Importance of RO to Master the K/A Comments:

- same as 70
- EDGs will assume load if required

Importance of SRO to Master the K/A Comments:

- same as 70

76. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Criteria to trip the turbine or reactor.
Re-Rate Survey: RO Impt: 4.3 SD .73 SRO Impt: 4.4 SD .65

Importance of RO to Master the K/A Comments:

- same as 71

Importance of SRO to Master the K/A Comments:

- same as 71
- Assume action will be taken by RO without requiring direction from SRO

77. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Operational status of EDGs.
Re-Rate Survey: RO Impt: 3.9 SD .72 SRO Impt: 4.3 SD .69

Importance of RO to Master the K/A Comments:

- same as 75
- EDGs will start if required.

Importance of SRO to Master the K/A Comments:

- same as 75
- Need to understand if 3.0.3 applies

78. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Generator overheating and the required actions.
Re-Rate Survey: RO Impt: 3.6 SD .75 SRO Impt: 3.8 SD .74

Importance of RO to Master the K/A Comments:

- same as 71
- Key is "ability to determine" not memorize
- system specific no a generic, as are most in this topic area

Importance of SRO to Master the K/A Comments:

- same as 71
- system specific no a generic, as are most in this topic area
- Assume this is slow enough that RO will await direction from SRO

79. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: sensors, detectors, indicators.
Re-Rate Survey: RO Impt: 3.0 SD .85 SRO Impt: 3.1 SD .87

Importance of RO to Master the K/A Comments:

- how you test this one on an exam?
- Too general for me to determine what knowledge is required. It is very important for both ROs and SROs to know what key parameters can be used to determine grid anomalies. Response of all sensors, detectors, etc would be much less important.
- RO cannot control

Importance of SRO to Master the K/A Comments:

- SRO needs to know when these should actuate.

80. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: controllers and positioners.
Re-Rate Survey: RO Impt: 3.0 SD .91 SRO Impt: 3.0 SD .91

Importance of RO to Master the K/A Comments:

- Assume most controllers will be powered from UPS
- Too general for me to determine what knowledge is required. It is very important for both ROs and SROs to know what key parameters can be used to determine grid anomalies. Response of all sensors, detectors, etc would be much less important.
- Similar comment to that for K/A 79. Now I am interpreting as impact on all controller and positioners and feel importance is insignificant as impact should be none existent except if power is lost (separate K/A for impacted system).
- GFE
- if the grid affects these, you are probably tripped
- GFE

Importance of SRO to Master the K/A Comments:

- Similar comment to that for K/A 79. Now I am interpreting as impact on all controller and positioners and feel importance is insignificant as impact should be none existent except if power is lost (separate K/A for impacted system).
- if the grid affects these, you are probably tripped
- GFE

81. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: pumps.
Re-Rate Survey: RO Impt: 3.1 SD .90 SRO Impt: 3.2 SD .92

Importance of RO to Master the K/A Comments:

- There are a lot of new K/As related to grid disturbances. Although these are important I hope we are not overemphasing due to recent events
- See comments for K/As 79 & 80. Effect on RCPs for PWR (Recirc Pumps in BWR) is important but should be covered by separate K/A for RCS.
- Too general for me to determine what knowledge is required. It is very important for both ROs and SROs to know what key parameters can be used to determine grid anomalies. Response of all sensors, detectors, etc would be much less important.
- Similar comment to that for K/A 79. Now I am interpreting as impact on all controller and positioners and feel importance is insignificant as impact should be none existent except if power is lost (separate K/A for impacted system).
- GFE
- GFE

Importance of SRO to Master the K/A Comments:

- GFE
- similar to k/a for esf

82. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Reactor Power.
Re-Rate Survey: RO Impt: 3.9 SD .89 SRO Impt: 4.0 SD .87

Importance of RO to Master the K/A Comments:

- ?
- Don't see the correlation between the two.
- Should result in small changes (a few MWt)

Importance of SRO to Master the K/A Comments:

- Needs to ensure license limit is not exceeded.
- Don't see the correlation between the two.

83. Knowledge of the interrelations between the Generator Voltage and Electric Grid Disturbance and the following: Turbine/Generator control.
Re-Rate Survey: RO Impt: 3.6 SD .83 SRO Impt: 3.7 SD .80

Importance of RO to Master the K/A Comments:

- very similar to 71

- system or event specifc..why are these generic? they deal with specific events and procedures!

Importance of SRO to Master the K/A Comments:

- very similar to 71
- system or event specifc..why are these generic? they deal with specific events and procedures!
- Needs to ensure license limit is not exceeded

84. Ability to operate and/or monitor the following as they apply to the Generator Voltage and Electric Grid Disturbance: grid frequency and voltage outside the generator capability curve.
Re-Rate Survey: RO Impt: 3.5 SD .84 SRO Impt: 3.6 SD .85

Importance of RO to Master the K/A Comments:

- Know where to find it
- same as 71
- not sure what this is talking about
- Limits for frequency and voltage are not presented on the generator capability curve.
- system or event specifc..why are these generic? they deal with specific events and procedures!

Importance of SRO to Master the K/A Comments:

- same as 71
- know where to find it
- system or event specifc..why are these generic? they deal with specific events and procedures!

85. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Voltage outside the generator capability curve.
Re-Rate Survey: RO Impt: 3.5 SD .81 SRO Impt: 3.6 SD .85

Importance of RO to Master the K/A Comments:

- same as 71
- Voltage limits are not presented on the generator capability curve.
- system or event specifc..why are these generic? they deal with specific events and procedures!
- Usually adequate time to respond using ARPs and/or AOPs

Importance of SRO to Master the K/A Comments:

- same as 71
- system or event specifc..why are these generic? they deal with specific events and procedures!

86. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: MVARS outside capability curve.
Re-Rate Survey: RO Impt: 3.4 SD .80 SRO Impt: 3.6 SD .84

Importance of RO to Master the K/A Comments:

- system or event specifc..why are these generic? they deal with specific events and procedures!

Importance of SRO to Master the K/A Comments:

- system or event specifc..why are these generic? they deal with specific events and procedures!
- same as 71

87. Ability to determine and interpret the following as they apply to the Generator Voltage and Electric Grid Disturbance: Generator Current outside the capability curve.
Re-Rate Survey: RO Impt: 3.5 SD .84 SRO Impt: 3.6 SD .87

Importance of RO to Master the K/A Comments:

- system or event specifc..why are these generic? they deal with specific events and procedures!
- Generator current is presented as a procedural limit, but not on capability curve.

Importance of SRO to Master the K/A Comments:

- system or event specifc..why are these generic? they deal with specific events and procedures!

Additional Comments:

- These questions seem a little ridiculous. I think something is wrong when you have to ask me the importance of some of these items.
- Seems like a lot of questions concerning Grid conditions and Generator capability...may have more to do with protecting company assets than protecting public health & safety.
- Our generator capability curve is Power, MVAR, and H2 pressure dependent.
- Looks like too many grid disturbance K/As. Plant emphasis should be on proper instrumentation, protective relaying and alarms. Don't let recent "headline events" skew the K/As too much.
- No Comments
- Keep up the good work!!

- there were many that I would have preferred putting a 2.6 or 3.4 or some other numeric value rather than a go/no go value (2.0 or 3.0). this may cause some data skew for you when you do your results. thanks for the opportunity.
- this seemed to focus on grid disturbances and how they relate to licensed operators. I have been the RO at the controls for 2 grid disturbance events. they happen so quickly there really is very little to do or monitor. automatic events take place in a few Hz and you enter your reactor trip procedure.
- far too much detail and duplication in generator K/As.
- With my limited experience I have not heard of some of the terms used in the survey, I have been fortunate to be in the mid-west where our challenges to grid stability have been localized and mostly caused by inclement weather.
- None
- The new Grid Emergency K/A's seemed to be too Theory oriented as opposed to operationally oriented. The description for the purpose of this survey was to revise Section 2 of the K/A Manual. It would be more appropriate to make these more operationally oriented and put them into Section 4.2, then it would be to put this large number of theory oriented K/A's into Section 2.
- At the risk of being an outlier, too much emphasis on Grid Disturbances for the Generic Section. Should be in Generic APEs.
- All of the grid K/A are event and system specific and do not belong in a generic topic area. Generics, on the written exam are not supposed to be system specific. Seems that with all these grid K/As the topic could become overly tested and not all that important.
- With the emphasis on generator parameters, I don't know if we reinforce enough information on this topic. Some of the specifics seem unimportant with respect to required actions for OOS parameters. Operator immediate actions should be tested more so than knowledge of "How" the parameter go out of spec.
- Seems to be some repeats.

ATTACHMENT 6: Which Exam Should Include Question: Comments

K/A 50 Knowledge of site corrosion processes such as, boric acid (PWR), chloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc.

- Should need to know conditions that can cause corrosion, and where they could occur. Most, if 0t all corrosion mechanisms are long-term issues that are more fully addressed by plant staff functions.
- As bad as Davis Besse was, it still does not belong on the site NRC exams.
- Continuing training ~2hrs /2 year cycle
- This does not fit under NRC exam criteria but rather INPO OE training.
- GFE if any.
- Other Organizations control this process not operations
- Many of the K/A's are encompassed in the Plant access training and Radworker classes. These are best left at that level and License exams focused on critical aspects of the Control Room function.
- None
- fundamentals GFE
- It is not clear if the GFE K/As cover these knowledge areas.

K/A 51: Knowledge of water chemistry controls such as, parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc.

- GET should include some basic concepts such as foreign material exclusion.
- This is an interface between Operations Management and Chemistry
- Continuing training ~2hrs /2 year cycle
- GFES for ROs would be fine, Out of Spec on TS / TRM actions good for SROs exam
- It is not clear if the GFE K/As cover these knowledge areas.

ATTACHMENT 7: First Survey Results – Importance to Safety Ratings

2.1.1 Knowledge of conduct of operations requirements.
Survey: RO Impt 3.8, SD .86 SRO Impt 4.2, SD .87
Catalog: RO Impt 3.7 SRO Impt 3.8

2.1.2 Knowledge of operator responsibilities during all modes of plant operation.
Survey: RO Impt 4.1, SD .80 SRO Impt 4.4, SD .73
Catalog: RO Impt 3.0 SRO Impt 4.0

2.1.3 Knowledge of shift turnover practices
Survey: RO Impt 3.5, SD .993 SRO Impt 3.6, SD 1.0
Catalog: RO Impt 3.0 SRO Impt 3.4

2.1.4 Knowledge of shift staffing requirements.
Survey: RO Impt 2.9, SD .95 SRO Impt 3.8, SD .96
Catalog: RO Impt 2.3 SRO Impt 3.4

2.1.5 Ability to locate and use procedures and directives related to shift staffing and activities
Survey: RO Impt 2.9, SD 1.04 SRO Impt 3.8, SD 1.0
Catalog: RO Impt 2.3 SRO Impt 3.4

2.1.6 Ability to supervise and assume a management role during transients
Survey: RO Impt 2.4, SD 1.07 SRO Impt 4.7, SD .57
Catalog: RO Impt 2.1 SRO Impt 4.3

2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
Survey: RO Impt 4.4, SD .74 SRO Impt 4.7, SD .48
Catalog: RO Impt 3.7 SRO Impt 4.4

2.1.8 Ability to coordinate personnel activities outside the control room.
Survey: RO Impt 3.4, SD .96 SRO Impt 4.1, SD .72
Catalog: RO Impt 3.8 SRO Impt 3.6

2.1.9 Ability to direct personnel activities inside the control room
Survey: RO Impt 2.9, SD 1.01 SRO Impt 4.5, SD .64
Catalog: RO Impt 2.5 SRO Impt 4.0

2.1.10 Knowledge of conditions and limitations in the facility license.
Survey: RO Impt 3.6, SD .93 SRO Impt 4.5, SD .67
Catalog: RO Impt 2.7 SRO Impt 3.9

2.1.11 Knowledge of less than one hour technical specification action statements for systems.

Survey: RO Impt 3.9, SD .86	SRO Impt 4.5, SD .68
Catalog: RO Impt 3.0	SRO Impt 3.8

2.1.12 Ability to apply technical specifications for a system.

Survey: RO Impt 3.4, SD .82	SRO Impt 4.7, SD .45
Catalog: RO Impt 2.9	SRO Impt 4.0

2.1.13 Knowledge of facility requirements for controlling vital / controlled access.

Survey: RO Impt 2.5, SD .90	SRO Impt 3.2, SD .97
Catalog: RO Impt 2.0	SRO Impt 2.9

2.1.14 Knowledge of system status criteria which require notification of plant personnel

Survey: RO Impt 2.9, SD 1.02	SRO Impt 3.9, SD .93
Catalog: RO Impt 2.5	SRO Impt 3.3

2.1.15 Ability to manage short-term information such as night and standing orders

Survey: RO Impt 2.7, SD 1.01	SRO Impt 3.3, 1.01
Catalog: RO Impt 2.3	SRO Impt 3.0

2.1.16 Ability to operate plant phone, paging system, and two-way radio

Survey: RO Impt 3.2, SD 1.31	SRO Impt 3.2, SD 1.27
Catalog: RO Impt 2.9	SRO Impt 2.8

2.1.17 Ability to make accurate, clear and concise verbal reports.

Survey: RO Impt 3.9, SD .92	SRO Impt 4.0, SD .89
Catalog: RO Impt 3.5	SRO Impt 3.6

2.1.18 Ability to make accurate, clear and concise logs, records, status boards, and reports.

Survey: RO Impt 3.6, SD .93	SRO Impt 3.8, SD .92
Catalog: RO Impt 2.9	SRO Impt 3.0

2.1.19 Ability to use plant computer to obtain and evaluate parametric information on system or component status.

Survey: RO Impt 3.9, SD .89	SRO Impt 3.8, SD .88
Catalog: RO Impt 3.0	SRO Impt 3.0

2.1.20 Ability to execute procedure steps.

Survey: RO Impt 4.6, SD .66	SRO Impt 4.6, SD .60
Catalog: RO Impt 4.3	SRO Impt 4.2

2.1.21 Ability to obtain and verify controlled procedure copy
Survey: RO Impt 3.5, SD 1.06 SRO Impt 3.5, SD 1.07
Catalog: RO Impt 3.1 SRO Impt 3.2

2.1.22 Ability to determine Mode of Operation
Survey: RO Impt 3.8, SD 1.02 SRO Impt 4.1, SD .97
Catalog: RO Impt 2.8 SRO Impt 3.3

2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.
Survey: RO Impt 4.3, SD .73 SRO Impt 4.4, SD .64
Catalog: RO Impt 3.9 SRO Impt 4.0

2.1.24 Ability to obtain and interpret station electrical and mechanical drawings.
Survey: RO Impt 3.5, SD .90 SRO Impt 3.9, SD .80
Catalog: RO Impt 2.8 SRO Impt 3.1

2.1.25 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.
Survey: RO Impt 3.3, SD .98 SRO Impt 3.6, SD .98
Catalog: RO Impt 2.8 SRO Impt 3.1

2.1.26 Knowledge of non-nuclear safety procedures (e.g. rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).
Survey: RO Impt 3.4, SD .95 SRO Impt 3.6, SD .92
Catalog: RO Impt 2.2 SRO Impt 2.6

2.1.27 Knowledge of system purpose and or function.
Survey: RO Impt 3.9, SD .99 SRO Impt 4.0, SD .98
Catalog: RO Impt 2.8 SRO Impt 2.9

2.1.28 Knowledge of the purpose and function of major system components and controls.
Survey: RO Impt 4.1, SD .84 SRO Impt 4.1, SD .83
Catalog: RO Impt 3.2 SRO Impt 3.3

2.1.29 Knowledge of how to conduct and verify valve lineups
Survey: RO Impt 3.7, SD 1.01 SRO Impt 3.6, SD .91
Catalog: RO Impt 3.4 SRO Impt 3.3

2.1.30 Ability to locate and operate components, including local controls.
Survey: RO Impt 4.4, SD .75 SRO Impt 4.0, SD .84
Catalog: RO Impt 3.9 SRO Impt 3.4

2.1.31 Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.
Survey: RO Impt 4.6, SD .58 SRO Impt 4.3, SD .72
Catalog: RO Impt 4.2 SRO Impt 3.9

2.1.32 Ability to explain and apply all system limits and precautions.
Survey: RO Impt 3.8, SD .67 SRO Impt 4.0, SD .69
Catalog: RO Impt 3.4 SRO Impt 3.8

2.1.33 Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.
Survey: RO Impt 3.9, SD .75 SRO Impt 4.6, SD .50
Catalog: RO Impt 3.4 SRO Impt 4.0

2.1.34 Ability to maintain primary and secondary plant chemistry within allowable limits
Survey: RO Impt 2.6, SD .94 SRO Impt 3.0, SD 1.02
Catalog: RO Impt 2.3 SRO Impt 2.9

2.2.1 Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.
Survey: RO Impt 4.5, SD .71 SRO Impt 4.4, SD .69
Catalog: RO Impt 3.7 SRO Impt 3.6

2.2.2 Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.
Survey: RO Impt 4.6, SD .58 SRO Impt 4.1, SD .86
Catalog: RO Impt 4.0 SRO Impt 3.5

2.2.3 Knowledge of the design, procedural, & operational differences between units
Survey: RO Impt 3.7, SD 1.01 SRO Impt 3.8, SD .98
Multi-unit respondents only:
Survey: RO Impt 3.8, SD .95 SRO Impt 3.9, SD .94
Catalog: RO Impt 3.1 SRO Impt 3.3

2.2.4 Ability to explain variations in control board layouts, systems, instrument and procedural actions between units at a facility
Survey: RO Impt 3.5, SD 1.05 SRO Impt 3.5, SD .94
Multi-unit respondents only:
Survey: RO Impt 3.6, SD .97 SRO Impt 3.6, SD .91
Catalog: RO Impt 2.8 SRO Impt 3.0*

2.2.5 Knowledge of the process for making changes in the facility as described in the FSAR

Survey: RO Impt 2.2, SD .79 SRO Impt 3.2, SD 1.03
Catalog: RO Impt 1.6 SRO Impt 2.7

2.2.6 Knowledge of the process for making changes in procedures as described in the safety analysis report.
Survey: RO Impt 2.9, SD .85 SRO Impt 3.7, SD .83
Catalog: RO Impt 2.3 SRO Impt 3.3

2.2.7 Knowledge of the process for conducting tests or experiments not in FSAR
Survey: RO Impt 2.6, SD .91 SRO Impt 3.4, SD 1.07
Catalog: RO 2.0 SRO 3.2

2.2.8 Knowledge of the process for determining if change/test/experiment involves a USQ
Survey: RO Impt 2.4, SD .86 SRO Impt 3.6, SD 1.01
Catalog: RO 1.8 SRO 3.3

2.2.9 Knowledge of process to determine if a change/test/experiment increases the probability or consequences of an accident
Survey: RO Impt 2.2, SD .81 SRO Impt 3.3, SD 1.11
Catalog: RO 2.0 SRO 3.3

2.2.10 Knowledge for determining if the margin of safety, as defined in T.S. is reduced by a proposed change/test/experiment
Survey: RO 2.4, SD .83 SRO 3.5, SD 1.08
Catalog: RO 1.9 SRO 3.3

2.2.11 Knowledge of the process for controlling temporary changes.
Survey: RO Impt 2.7, SD .88 SRO Impt 3.7, SD .78
Catalog: RO Impt 2.5 SRO Impt 3.4*

2.2.12 Knowledge of surveillance procedures.
Survey: RO Impt 3.7, SD .81 SRO Impt 4.1, SD .77
Catalog: RO Impt 3.0 SRO Impt 3.4

2.2.13 Knowledge of tagging and clearance procedures.
Survey: RO Impt 4.1, SD .79 SRO Impt 4.3, SD .69
Catalog: RO Impt 3.6 SRO Impt 3.8

2.2.14 Knowledge of the process for making configuration changes.
Survey: RO Impt 3.0, SD .93 SRO Impt 3.8, SD .85
Catalog: RO Impt 2.1 SRO Impt 3.0

2.2.15 Ability to identify and utilize as-built design and configuration change documentation to ascertain expected current plant configuration and operate the plant.

Survey: RO 2.8, SD 1.05 SRO 3.3, SD 1.03
Catalog: RO 2.2 SRO 2.9

2.2.16 Knowledge of the process for making of field changes
Survey: RO 2.4, SD 1.01 SRO 3.0, SD 1.12
Catalog: RO 1.9 SRO 2.6*

2.2.17 Knowledge of the process for managing maintenance activities during power operations.
Survey: RO Impt 2.7, SD .82 SRO Impt 4.0, SD .80
Catalog: RO Impt 2.3 SRO Impt 3.5

2.2.18 Knowledge of the process for managing maintenance activities during shutdown operations.
Survey: RO Impt 2.8, SD .86 SRO Impt 4.0, SD .78
Catalog: RO Impt 2.3 SRO Impt 3.6

2.2.19 Knowledge of maintenance work order requirements.
Survey: RO Impt 2.3, SD .82 SRO Impt 3.4, SD .91
Catalog: RO Impt 2.1 SRO Impt 3.1

2.2.20 Knowledge of the process for managing troubleshooting activities.
Survey: RO Impt 2.6, SD .84 SRO Impt 3.8, SD .83
Catalog: RO Impt 2.2 SRO Impt 3.3

2.2.21 Knowledge of pre- and post-maintenance operability requirements.
Survey: RO Impt 2.9, SD .80 SRO Impt 4.1, SD .79
Catalog: RO Impt 2.3 SRO Impt 3.5

2.2.22 Knowledge of limiting conditions for operations and safety limits.
Survey: RO Impt 4.0, SD .77 SRO Impt 4.7, SD .48
Catalog: RO Impt 3.4 SRO Impt 4.1

2.2.23 Ability to track limiting conditions for operations.
Survey: RO Impt 3.1, SD .87 SRO Impt 4.3, SD .67
Catalog: RO Impt 2.6 SRO Impt 3.8

2.2.24 Ability to analyze the affect of maintenance activities on LCO status.
Survey: RO Impt 3.0, SD .85 SRO Impt 4.2, SD .69
Catalog: RO Impt 2.6 SRO Impt 3.8

2.2.25 Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.

Survey: RO Impt 3.2, SD .84 SRO Impt 4.2, SD .68
Catalog: RO Impt 2.5 SRO Impt 3.7

2.2.26 Knowledge of refueling administrative requirements.

Survey: RO Impt 2.8, SD .85 SRO Impt 3.9, SD .80
Catalog: RO Impt 2.5 SRO Impt 3.7

2.2.27 Knowledge of the refueling process.

Survey: RO Impt 2.8, SD .84 SRO Impt 3.7, SD .75
Catalog: RO Impt 2.6 SRO Impt 3.5

2.2.28 Knowledge of new and spent fuel movement procedures. |

Survey: RO Impt 2.5, SD .93 SRO Impt 3.4, SD .87
Catalog: RO Impt 2.6 SRO Impt 3.5

2.2.29 Knowledge of SRO fuel handling responsibilities. |

Survey: RO Impt 2.0, SD .90 SRO Impt 4.1, SD .72
Catalog: RO Impt 1.6 SRO Impt 3.8

2.2.30 Knowledge of RO duties in the control room during fuel handling such as | alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.

Survey: RO Impt 3.9, SD .82 SRO Impt 3.8, SD .85
Catalog: RO Impt 3.5 SRO Impt 3.3

2.2.31 Knowledge of procedures and limitation involved in initial core loading

Survey: RO 2.5, SD 1.08 SRO 3.2, SD 1.21
Catalog: RO 2.2 SRO 2.9

2.2.32 Knowledge of the effects of alterations on core configuration. |

Survey: RO Impt 3.0, SD .96 SRO Impt 3.6, SD .93
Catalog: RO Impt 2.3 SRO Impt 3.3

2.2.33 Knowledge of the process for determining the internal and external effects on core reactivity

Survey: RO 3.5, SD 1.08 SRO 3.6, SD 1.00
Catalog: RO 2.5 SRO 2.9*

2.2.34 Knowledge of the process for determining the internal and external effects on |core reactivity.

Survey: RO Impt 3.9, SD .91 SRO Impt 4.0, SD .86
Catalog: RO Impt 2.8 SRO Impt 3.2*

2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements.

Survey: RO Impt 3.0, SD .85 SRO Impt 3.5, SD .86
Catalog: RO Impt 2.6 SRO Impt 3.0

2.3.2 Knowledge of facility ALARA program.

Survey: RO Impt 3.1, SD .95 SRO Impt 3.2, SD .94
Catalog: RO Impt 2.5 SRO Impt 2.9

2.3.3 Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g., waste disposal and handling systems).

Survey: RO Impt 2.2, SD .90 SRO Impt 3.0, SD .88
Catalog: RO Impt 1.8 SRO Impt 2.9

2.3.4 Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.

Survey: RO Impt 3.2, SD .94 SRO Impt 3.7, SD .83
Catalog: RO Impt 2.5 SRO Impt 3.1

2.3.5 Knowledge of use and function of personnel monitoring equipment

Survey: RO 2.9, SD 1.06 SRO 2.9, SD 1.02
Catalog: RO 2.3 SRO 2.5

2.3.6 Knowledge of the requirements for reviewing and approving release permits.

Survey: RO Impt 2.5, SD .95 SRO Impt 3.9, SD .77
Catalog: RO Impt 2.1 SRO Impt 3.1

2.3.7 Knowledge of the process for preparing a radiation work permit.

Survey: RO Impt 1.7, SD .72 SRO Impt 1.9, SD .88
Catalog: RO Impt 2.0 SRO Impt 3.3

2.3.8 Knowledge of the process for performing a planned gaseous radioactive release.

Survey: RO Impt 3.2, SD .95 SRO Impt 3.7, SD .80
Catalog: RO Impt 2.3 SRO Impt 3.2

2.3.9 Knowledge of the process for performing a containment purge.

Survey: RO Impt 3.3, SD .90 SRO Impt 3.5, SD .89
Catalog: RO Impt 2.5 SRO Impt 3.4

2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure

Survey: RO 3.1, SD .99 SRO 3.4, SD 1.01
Catalog: RO 2.9 SRO 3.3

2.3.11 Ability to control radiation releases.
Survey: RO Impt 3.7, SD .92 SRO Impt 4.0, SD .85
Catalog: RO Impt 2.7 SRO Impt 3.2

2.4.1 Knowledge of EOP entry conditions and immediate action steps.
Survey: RO Impt 4.6, SD .58 SRO Impt 4.8, SD .38
Catalog: RO Impt 4.3 SRO Impt 4.6

2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.
Survey: RO Impt 4.5, SD .63 SRO Impt 4.6, SD .56
Catalog: RO Impt 3.9 SRO Impt 4.1

2.4.3 Ability to identify post-accident instrumentation.
Survey: RO Impt 3.7, SD .83 SRO Impt 3.9, SD .80
Catalog: RO Impt 3.5 SRO Impt 3.8

2.4.4 Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.
Survey: RO Impt 4.5, SD .61 SRO Impt 4.7, SD .50
Catalog: RO Impt 4.0 SRO Impt 4.3

2.4.5 Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.
Survey: RO Impt 3.7, SD .82 SRO Impt 4.3, SD .80
Catalog: RO Impt 2.9 SRO Impt 3.6

2.4.6 Knowledge symptom based EOP mitigation strategies.
Survey: RO Impt 3.7, SD .78 SRO Impt 4.4, SD .72
Catalog: RO Impt 3.1 SRO Impt 4.0

2.4.7 Knowledge of event-based EOP mitigation strategies
Survey: RO Impt 3.5, SD .95 SRO Impt 4.1, SD 1.00
Catalog: RO Impt 3.1 SRO Impt 3.8

2.4.8 Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.
Survey: RO Impt 3.6, SD .87 SRO Impt 4.2, SD .84
Catalog: RO Impt 3.0 SRO Impt 3.7

2.4.9 Knowledge of low power / shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.
Survey: RO Impt 3.8, SD .75 SRO Impt 4.2, SD .64
Catalog: RO Impt 3.3 SRO Impt 3.9

2.4.10 Knowledge of annunciator response procedures.
Survey: RO Impt 3.9, SD .81 SRO Impt 3.9, SD .75
Catalog: RO Impt 3.0 SRO Impt 3.1

2.4.11 Knowledge of abnormal condition procedures.
Survey: RO Impt 4.0, SD .68 SRO Impt 4.2, SD .58
Catalog: RO Impt 3.4 SRO Impt 3.6

2.4.12 Knowledge of general operating crew responsibilities during emergency operations.
Survey: RO Impt 4.0, SD .81 SRO Impt 4.3, SD .76
Catalog: RO Impt 3.4 SRO Impt 3.9

2.4.13 Knowledge of crew roles and responsibilities during EOP flowchart use
Survey: RO 3.4, SD 1.19 SRO 3.8, SD 1.25
Catalog: RO 3.3 SRO 3.9

2.4.14 Knowledge of general guidelines for EOP flowchart use
Survey: RO 3.2, SD 1.13 SRO 3.9, SD 1.25
Catalog: RO 3.0 SRO 3.9

2.4.15 Knowledge of communications procedures associated with EOP implementation.
Survey: RO 3.4, SD 1.01 SRO 3.8, SD .87
Catalog: RO 3.0 SRO 3.5

2.4.16 Knowledge of EOP implementation hierarchy and coordination with other support procedures.
Survey: RO Impt 3.5, SD .92 SRO Impt 4.4, SD .63
Catalog: RO Impt 3.0 SRO Impt 4.0

2.4.17 Knowledge of EOP terms and definitions.
Survey: RO Impt 3.9, SD .89 SRO Impt 4.3, SD .80
Catalog: RO Impt 3.1 SRO Impt 3.8

2.4.18 Knowledge of the specific bases for EOPs.
Survey: RO Impt 3.3, SD .80 SRO Impt 4.0, SD ..72
Catalog: RO Impt 2.7 SRO Impt 3.6

2.4.19 Knowledge of EOP layout, symbols, and icons.
Survey: RO Impt 3.4, SD .92 SRO Impt 4.1, SD .88
Catalog: RO Impt 2.7 SRO Impt 3.7

2.4.20 Knowledge of operational implications of EOP warnings, cautions, and notes.
Survey: RO Impt 3.8, SD .70 SRO Impt 4.3, SD .60
Catalog: RO Impt 3.3 SRO Impt 4.0

2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions including:
1. Reactivity control
2. Core cooling and heat removal
3. Reactor coolant system integrity
4. Containment conditions
5. Radioactivity release control.

Survey: RO Impt 4.0, SD .89 SRO Impt 4.6, SD .60
Catalog: RO Impt 3.7 SRO Impt 4.3

2.4.22 Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.
Survey: RO Impt 3.6, SD .79 SRO Impt 4.4, SD .68
Catalog: RO Impt 3.0 SRO Impt 4.0

2.4.23 Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.
Survey: RO Impt 3.4, SD .74 SRO Impt 4.4, SD .67
Catalog: RO Impt 2.8 SRO Impt 3.8

2.4.24 Knowledge of loss of cooling water procedures.
Survey: RO Impt 3.9, SD .69 SRO Impt 4.2, SD .58
Catalog: RO Impt 3.3 SRO Impt 3.7

2.4.25 Knowledge of fire protection procedures.
Survey: RO Impt 3.3, SD .84 SRO Impt 3.7, SD .77
Catalog: RO Impt 2.9 SRO Impt 3.4

2.4.26 Knowledge of facility protection requirements including fire brigade and portable fire fighting equipment usage.
Survey: RO Impt 3.1, SD .92 SRO Impt 3.6, SD .90
Catalog: RO Impt 2.9 SRO Impt 3.3

2.4.27 Knowledge of fire in the plant procedure.
Survey: RO Impt 3.4, SD .87 SRO Impt 3.9, SD .72
Catalog: RO Impt 3.0 SRO Impt 3.5

2.4.28 Knowledge of procedures relating to emergency response to sabotage.
Survey: RO Impt 3.1, SD .91 SRO Impt 4.0, SD .82
Catalog: RO Impt 2.3 SRO Impt 3.3

2.4.29 Knowledge of the emergency plan.
Survey: RO Impt 3.1, SD .86 SRO Impt 4.4, SD .65
Catalog: RO Impt 2.6 SRO Impt 4.0

2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies.

Survey: RO Impt 2.6, SD .73 SRO Impt 4.2, SD .76
Catalog: RO Impt 2.2 SRO Impt 3.6

2.4.31 Knowledge of annunciators alarms and indications, and use of the response instructions.

Survey: RO Impt 4.1, SD .71 SRO Impt 4.0, SD .72
Catalog: RO Impt 3.3 SRO Impt 3.4

2.4.32 Knowledge of operator response to loss of all annunciators.

Survey: RO Impt 3.6, SD .82 SRO Impt 4.0, SD .75
Catalog: RO Impt 3.3 SRO Impt 3.5

2.4.33 Knowledge of the process used track inoperable alarms.

Survey: RO Impt 3.0, SD .86 SRO Impt 3.3, SD .90
Catalog: RO Impt 2.4 SRO Impt 2.8

2.4.34 Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.

Survey: RO Impt 4.1, SD .68 SRO Impt 4.0, SD .77
Catalog: RO Impt 3.8 SRO Impt 3.6

2.4.35 Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.

Survey: RO Impt 3.6, SD .86 SRO Impt 3.8, SD .81
Catalog: RO Impt 3.3 SRO Impt 3.5

2.4.36 Knowledge of chemistry / health physics tasks during emergency operations.

Survey: RO Impt 2.4, SD .82 SRO Impt 3.0, SD .96
Catalog: RO Impt 2.0 SRO Impt 2.8

2.4.37 Knowledge of the lines of authority during an emergency

Survey: RO 3.2, SD 1.09 SRO 4.1, SD .9
Catalog: RO 2.0 SRO 3.5

2.4.38 Ability to take actions called for in the facility emergency plan, including (if required) supporting or acting as emergency coordinator.

Survey: RO Impt 2.4, SD .99 SRO Impt 4.4, SD ..69
Catalog: RO Impt 2.2 SRO Impt 4.0

2.4.39 Knowledge of the RO's responsibilities in emergency plan implementation.

Survey: RO Impt 3.9, SD .92 SRO Impt 3.8, SD .89
Catalog: RO Impt 3.3 SRO Impt 3.1

2.4.40 Knowledge of the SRO's responsibilities in emergency plan implementation.

Survey: RO Impt 2.7, SD .87	SRO Impt 4.5, SD .58
Catalog: RO Impt 2.3	SRO Impt 4.0

2.4.41 Knowledge of the emergency action level thresholds and classifications.

Survey: RO Impt 2.9, SD .84	SRO Impt 4.6, SD .56
Catalog: RO Impt 2.3	SRO Impt 4.1

2.4.42 Knowledge of emergency response facilities.

Survey: RO Impt 2.6, SD .85	SRO Impt 3.8, SD .91
Catalog: RO Impt 2.3	SRO Impt 3.7

2.4.43 Knowledge of emergency communications systems and techniques.

Survey: RO Impt 3.2, SD .92	SRO Impt 3.8, SD .84
Catalog: RO Impt 2.8	SRO Impt 3.5

2.4.44 Knowledge of emergency plan protective action recommendations.

Survey: RO Impt 2.4, SD .81	SRO Impt 4.4, SD .63
Catalog: RO Impt 2.1	SRO Impt 4.0

2.4.45 Ability to prioritize and interpret the significance of each annunciator or alarm.

Survey: RO Impt 4.1, SD .78	SRO Impt 4.3, SD .62
Catalog: RO Impt 3.3	SRO Impt 3.6

2.4.46 Ability to verify that the alarms are consistent with the plant conditions.

Survey: RO Impt 4.2, SD .62	SRO Impt 4.2, SD .61
Catalog: RO Impt 3.5	SRO Impt 3.6

2.4.47 Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Survey: RO Impt 4.2, SD .70	SRO Impt 4.2, SD .63
Catalog: RO Impt 3.4	SRO Impt 3.7

2.4.48 Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.

Survey: RO Impt 4.2, SD .76	SRO Impt 4.4, SD .59
Catalog: RO Impt 3.5	SRO Impt 3.8

2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.

Survey: RO Impt 4.6, SD .59	SRO Impt 4.4, SD .75
Catalog: RO Impt 4.0	SRO Impt 4.0

2.4.50 Ability to verify system alarm set points and operate controls identified in the alarm response manual.

Survey: RO Impt 4.2, SD .78	SRO Impt 4.0, SD .78
Catalog: RO Impt 3.3	SRO Impt 3.3

ATTACHMENT 4
SUMMARY OF TELECONFERENCE WITH NRC ON FEBRUARY 16, 2006

Summary of Telecon – February 16,2006

"A. NRC has requested the following three specific KAs be added to the Generic Section to address Commission concerns over grid communication. The WOG, via Westinghouse (Schiffley ltr, dtd 11/29/05), has agreed to include the following KAs in its survey validation as per NRC request.

1) Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, coordination with the transmission system operator.

2) Ability to analyze the effect of maintenance activities (such as degraded power sources) on the status of conditions for operations.

3) Knowledge of which events related to system operation/status should be reported to internal organizations or external agencies (e.g., the state, the NRC, or the transmission system operator)."

Agreed.

"B. RECOMMEND adding the following two (2) NEW KAs to the Generic Section.

We recommend that you add these to the GFE section.

Change to read something like

Knowledge of site corrosion processes such as: boric acid (PWR), choloride stress, cathodic, galvanic, caustic stress, conditions necessary for corrosion, effects of corrosion on plant systems, etc..

1. Knowledge of site corrosion processes including:
- Boric acid (PWR)
- Chloride stress
- Cathodic
- Galvanic
- Caustic stress
- Intergranular stress
- Conditions necessary for corrosion
- Materials susceptible to corrosion
- Effects of corrosion on plant systems

Rationale:

System 002K5.20 (RCS)"Knowledge of the operational implications of the following concepts as they apply to the RCS: corrosion control principles." has an importance to safety rating of 2.3 for ROs (2.7 for SROs). Job incumbents might rate this higher today in light of Davis-Besse. In any case, the problems with corrosion are inherent to most of the piping systems and this knowledge is better covered as a generic K/A.

Knowledge of water chemistry controls such as: parameters monitored, actions for out of specification results, failed fuel indications, effects of impurities on cladding, etc...

2. Knowledge of reactor water chemistry controls including:
- Parameters monitored
- Actions for out-of-specification results
- Limits for technical specifications
- Control and removal of impurities
- Radiochemistry
- Analytical results and core conditions, including normal values
- Parameter changes during accidents and transients
- failed fuel indications
- sampling methods (normal and post-accident)
- Radiolysis and recombining of water
- Effects of impurities on fuel cladding
- Intrusion of contaminants (resin, oil, organics)
- Chemistry effects on radiation field control and source terms

Rationale:

Although the above K/A might be included into the RCS system section, as opposed to the generic section of the K/A catalog, it may be some time before the remainder of the Catalog will be updated. Therefore, consider adding the above K/A to the generic section now."

TWG/BWROG will send re-written KA's using 'such as' to be included in Generic Fundamentals Section.

"C. Resolution and agreement to the disposition of new KAs, as noted in the file below. Note that these issues are our response to your resolution and response to new KAs, in particular. SEE YOUR FILE ATTACHED FOLLOWED BY OUR COMMENTS/QUESTIONS."

See page 2.

D. Discussion of your/WOGs willingness to add new KAs on Degraded Voltage to E/APEs to Section 4 of the Catalog ... as offered during the November '05 meeting.

TWG/BWROG agreed to generate KA's for consideration. (ACTION: McCall/Sawyer/Hippely).

NRC Comments and TWG/BWROG Resolution

1. page #2, 1st bullet - Request WOG add 'Conservative Decision Making" as an example, i.e., "such as," to the appropriate 2.1 K/A on the follow-up survey.

   Add new KA to section 2.1.
   "Knowledge of conservative decision making practices."

2. page #2, 2nd bullet - Add "industrial" prior to "safety procedures" and change "e.g.," to "such as" in this and other similar K/As. NOTE: K/A 2.1.26 was NOT a K/A presumably scheduled to "re-rated." However, consideration should be given to "re-rating" the re-written K/A 2.1.26.

   NRC will revise 2.1.26 to state 'industrial' and include 'such as' statement and not submit for re-rating.
   No action required from TWG/BWROG.

3. page #2, 4th bullet - "Interpret and implement ..." was deemed covered in existing K/A 2.1.20. However, I believe that we would like the recommendation for the new K/A to be rated in the new survey albeit with it re-written to eliminate reference to "dual format procedures."

   NRC will revise 2.1.20 to "Ability to interpret and execute procedure steps" and not submit for re-rating.
   No action required from TWG/BWROG.

4. page #2, 6th bullet - Recommended K/A knowledge regarding "Control Room Access Control" should be added as a "such as" or "including" example to K/A 2.1.13 and re-rated.

   NRC accepted TWG/BWROG explanation regarding 2.1.13
   No action required from TWG/BWROG.

5. page #3, 4th bullet - "Ability to identify and interpret diverse indications ... " is significantly different from K/A 2.1.31. Therefore, it should be rated as a new K/A on the follow-up survey.

   Add new KA to section 2.1.
   "Ability to identify and interpret diverse indications to validate the response of another indicator."

6. page #3, 7th bullet - Add knowledge of "10 CFR 55 requirements for maintenance of an RO/SRO license" and "continuing training requirements" to K/A 2.1.4 on the follow-up survey.

   Revise 2.1.4 to include "10CFR55" in list following 'such as' and submit for re-rating.

7. page #4, 4th bullet - Revise re-written K/A 2.4.28 to include "site security plan." -- 'Knowledge of procedures relating to the site security plan including a security event."

   NRC accepted TWG/BWROG explanation regarding 2.4.28
   No action required from TWG/BWROG.

8. page #4, 8th bullet - "Ability to determine operability/availability of safety related equipment" should be rated as a new K/A on the follow-up survey.

   Add new KA to section ?. Add to section 2.2
   "Ability to determine operability and/or availability of safety related equipment"

9. page #5, 7th bullet - "Ability to determine when it is appropriate to shutdown the unit" should be rated as a new K/A on the follow-up survey. The explanation for not including in the follow-up survey - "No" - does not make sense.

   NRC accepted TWG/BWROG explanation regarding conduct of operations and conservative decision making.
   No action required from TWG/BWROG.

10. page 6, 4th bullet - Knowledge of the plant-specific transition criteria from EOPs to Severe Accident Management Guidelines" should be rated as a new K/A on the follow-up survey.

    NRC will revise 2.4.16 to incorporate "support procedures or guidelines" and include "operating procedures, AOPs, SAMGs" in the 'such as' statement. This KA will not be submitted for re-rating.
    No action required from TWG/BWROG.

General Comments:

(1) Request WOG explanation regarding the meaning of "pertaining to licensed operator duties" in revised K/As 2.3.1 and 2.3.2. In other words, explain the knowledge related to Radiological Safety Principles and Safety Procedures that is unique to the licensed operator position but is not required knowledge for a radiation worker.

    NRC agreed to leave revisions as-is with respect to 'pertaining to licensed operator duties'.
    No action required from TWG/BWROG.

(2) Confirm that original K/A 2.1.11, which is designated for re-assignment to section 2.2, is re-worded to test the operators knowledge "of less than **or equal to** one hour technical specification action statements for systems."

    Agreed. <u>Attendees</u>

NRC
Fred Guenther
John Monro
George Usova
Girija Shukla

BWROG
Ken McCall, GE

WOG
Charles Sawyer, Duke Energy
Paul Hippely, Westinghouse
John Hilton, Westinghouse
Steve DiTommaso, Westinghouse
Lynn Moyer, PSHA
Christine DiMuzio, Westinghouse