



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
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July 31, 2015

South Carolina Electric & Gas Company  
ATTN: Mr. Paul Mothena  
Manager, Nuclear Training, Unit 2  
Virgil C. Summer Nuclear Station  
P. O. Box 88 (Mail Code P40)  
Jenkinsville, SC 29065-0088

**SUBJECT: V. C. SUMMER NUCLEAR POWER PLANT – NRC OPERATOR LICENSE  
EXAMINATION INTERIM REPORT 05200027/2015302**

Dear Mr. Mothena:

On May 22, 2015, members of the V. C. Summer Nuclear Power Plant, Unit 2, administered the written examination.

Four Reactor Operator (RO) and 10 Senior Reactor Operator (SRO) applicants were administered the written examination. The operating test will be administered at a later date, consequently, results of the applicant's performance on the written examination will also be provided at a later date following administration of the operating test. There were six post-administration comments concerning the written examination. These comments, and the NRC resolution of them, are summarized in Enclosure 2.

The initial RO and SRO written examinations submitted by your staff met the guidelines for quality contained in NUREG-1021, Operator Licensing Examination Standards for Power Reactors, Revision 10 following review by the NRC and mutually agreed upon changes.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <http://www.nrc.gov/reading-rm.adams.html> (the Public Electronic Reading Room).

If you have any questions concerning this letter, please contact me at (404) 997-4662.

Sincerely,

*/RA/*

Eugene F. Guthrie, Chief  
Operations Branch 2  
Division of Reactor Safety

Docket Nos. 52-027  
License Nos. NPF-93

Enclosures:

1. Report Details
2. Facility Comments and NRC Resolution

cc: See Page 3

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Letter to Paul Mothena from Eugene F. Guthrie dated July 31, 2015.

SUBJECT: V. C. SUMMER NUCLEAR POWER PLANT – NRC OPERATOR LICENSE  
EXAMINATION INTERIM REPORT 05200027/2015302

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION II

Docket No.: 52-027

License No.: NPF-93

Report No.: 05200027/2015302

Licensee: South Carolina Electric & Gas Company

Facility: V. C. Summer Nuclear Power Plant, Unit 2

Location: Jenkinsville, South Carolina

Date: Written Examination – May 22, 2015

Examiners: Mark A. Bates, Chief Examiner, Senior Operations Examiner

Approved by: Eugene F. Guthrie, Chief  
Operations Branch 2  
Division of Reactor Safety



## SUMMARY

ER 05200027/2015302, 05/22/2015; V. C. Summer Nuclear Power Plant, Unit 2; Operator License Examinations.

Nuclear Regulatory Commission (NRC) examiners conducted an initial examination in accordance with the guidelines in Revision 10 of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." This examination implemented the operator licensing requirements identified in 10 CFR §55.41 and §55.43, as applicable.

Members of the V. C. Summer Unit 2 staff developed the written examination. The NRC developed the written examination outlines.

The initial RO and SRO written examinations submitted by your staff met the guidelines for quality contained in NUREG-1021 following review by the NRC and mutually agreed upon changes.

The NRC will administer the operating test on a date to be determined later. Members of the V. C. Summer Unit 2 training staff administered the written examination on May 22, 2015. Four Reactor Operator (RO) and 10 Senior Reactor Operator (SRO) applicants took the written examination. Official scores for those applicants taking the written examination will be communicated at a later date, following administration of the operating test.

There were six post-examination comments.

No findings were identified.

## REPORT DETAILS

### 4. OTHER ACTIVITIES

#### 4OA5 Operator Licensing Examinations

##### a. Inspection Scope

The NRC did not determine the percentage of submitted questions that required replacement or significant modification, or that clearly did not conform with the intent of the approved knowledge and ability (K/A) statement. The decision to not perform this evaluation was made in conjunction with implementing a more collaborative examination development effort between the NRC and the licensee for the first AP-1000 license examination. The NRC evaluated each question to ensure that appropriate changes were made in order for the administered examination to meet the NUREG-1021 criteria.

The NRC reviewed the licensee's examination security measures while preparing the examinations in order to ensure compliance with 10 CFR §55.49, "Integrity of examinations and tests."

The NRC will administer the operating test on a date to be determined later.

##### b. Findings

No findings were identified.

The NRC developed the written examination sample plan outline. Members of the V.C. Summer Unit 2 training staff developed the written examination. All examination material was developed in accordance with the guidelines contained in Revision 10 of NUREG-1021. The NRC reviewed the proposed examination. Examination changes agreed upon between the NRC and the licensee were made per NUREG-1021 and incorporated into the final version of the examination materials.

The NRC did not determine the percentage of submitted questions that required replacement or significant modification, or that clearly did not conform with the intent of the approved knowledge and ability (K/A) statement.

The written examination was administered to four RO applicants and 10 SRO applicants. Results of the written examination will be communicated following administration of the operating test.

The licensee submitted six post-examination comments concerning the written examination. A copy of the final written examination, and answer key with all changes incorporated may be accessed not earlier than May 24, 2017, in the ADAMS system (ADAMS Accession Numbers ML15211A385 and ML15211A391). A complete text of the licensee's post-examination comments can be found in ADAMS under Accession Number ML15211A393.

#### 4OA6 Meetings, Including Exit

##### Exit Meeting Summary

On July 31, 2015, the NRC Chief Examiner discussed, via telephone, issues associated with the written examination with Paul Mothena, Training Manager, and members of the V.C. Summer training staff. The examiners asked the licensee if any of the examination material was proprietary. Proprietary information was identified and will be handled in accordance with NRC policy.

## KEY POINTS OF CONTACT

### Licensee personnel

R. Jones, Site Vice President, Unit 2 & 3

A. Barbee, Training Director

P. Mothena, Training Manager, Unit 2 & 3

P. Leary, Operations Training Manager, Unit 2 & 3

S. Dimeler, Operations Training Examination Development Lead

### NRC personnel

T. Chandler, Resident Inspector

## Facility Post-Examination Comments and NRC Resolutions

### FACILITY POST-EXAMINATION COMMENTS AND NRC RESOLUTIONS

A complete text of the licensee's post examination comments can be found in ADAMS under Accession Number ML15211A393.

#### **RO QUESTION #20:**

##### **Comment:**

The licensee contended that both "C" and "D" were correct answers due to newly discovered procedure deficiencies.

The licensee stated that AOP-904, "Security Events," directed operators to perform either AOP-601, "Evacuation of Control Room," or AOP-602, "DAS Operation at Local Cabinets." The licensee also stated that the AOP-904 Background Document supported that operators would perform either AOP-601 or AOP-602, depending on which location was safe and functional. This logic was used to support the as-given written question when it was originally submitted.

Upon further review, after the examination was administered, the licensee recognized that AOP-601 would be expected to be entered and performed up to the point where conditions would prevent continuation in the procedure. At that time, AOP-601 would direct the operators to continue with AOP-602. Therefore, with the conditions provided in the stem of the question, both AOP-601 and AOP-602 would be required to be performed; thereby making both "C" and "D" correct answer choices.

##### **NRC Discussion:**

The examination question solicited which of the two AOPs, 601 or 602, would be performed in accordance with AOP-904, if the control room was evacuated. AOP-904 provided an option to enter either AOP-601 or AOP-602. Operators could enter AOP-601 from AOP-904, even if the Remote Shutdown Workstation (RSW) could not be occupied. Steps at the beginning of AOP-601, including tripping the reactor, would be expected to be performed prior to the operators evacuating the control room; therefore, AOP-601 could be performed prior to entering AOP-602.

AOP-904 stated that one or the other AOP was required to be entered from AOP-904. Operators, who knew the content of AOP-601, would generally first enter AOP-601, and then enter AOP-602 when directed to do so by Step 4 of AOP-601. However, AOP-904 also provided an option to go directly to AOP-602 if plant conditions warranted.

The first part of the question remained valid; therefore, given that AOP-601 or AOP-602 could be performed, both "C" and "D" were accepted as correct answer choices.

##### **NRC Resolution:**

The answer key was changed to accept both "C" and "D" as correct answers.

## Facility Post-Examination Comments and NRC Resolutions

### RO QUESTION #57:

#### Comment:

The licensee contended that there was not enough design information to support what they originally believed to be the correct answer for the first part of the question. The licensee contended that determining the correct answer for this part was dependent on more than just transport time from the steam generator to the applicable radiation monitor. In support of this, the licensee referred to an Electrical Power Research Institute (EPRI) document that indicated that radiation monitors may have delay times associated with them. The licensee also pointed to their simulator as not showing an increase in either Steam Generator Blowdown System (BDS) or Turbine Drain System/Condenser Air Removal System (TDS/CMS) radiation monitors during a steam generator tube leak.

The licensee proposed that this question be deleted from the examination due to a lack of supporting documentation for the first part of the question, which asked the applicants whether BDS or TDS radiation monitors would first detect a steam generator tube leak.

#### NRC Discussion:

The licensee provided the EPRI document as an indication that radiation monitors could have design characteristics that would cause the monitor to respond differently to radiation. For the V.C. Summer site, the licensee can provide documentation on how their site-specific radiation monitors are designed to respond, therefore the EPRI document was only considered as evidence that radiation monitors are site specific. Therefore, radiation monitor response would differ based on each facility's choices for design and setup of their radiation detection systems. For these reasons, the EPRI document was viewed as irrelevant for determining which radiation detector would first show indication of the tube leak.

The examination question only asked for the detection of radiation and did not specify radiation levels reaching alarm setpoints; therefore, the question was considered as mainly a radiation transport related question in that, whatever radiation monitor location received radiation first, would indicate first, even if that indication was an extremely small magnitude.

Further discussions with the licensee led to the recognition that leak location would significantly influence the transport of radiation with the given plant conditions. For example, if the leak was located close to the tube sheet, then it is likely that the BDS radiation monitors would first detect the leak. If the leak was located toward the top of the tubes, then it would be likely that the TDS monitors would first detect the leak. This forced the applicant to make an assumption on the location of the leak. It was then concluded that the correct answer then depended on the assumptions that the applicant made with regards to leak location; therefore, either answer for the first part of the question could be correct. Accepting both answers for the first part of the question resulted in answers "B" and "D" both being accepted as correct answer choices.

The second portion of the question, which pertained to the CMS system response to the TDS radiation monitors reaching their high setpoint, remained valid because it solely tested knowledge of system design features.

#### NRC Resolution:

The answer key was changed to accept both "B" and "D" as correct answers.

## Facility Post-Examination Comments and NRC Resolutions

### RO QUESTION #58:

#### Comment:

The licensee contended that a change made during the review process to ensure that the second part of the question contained a job link to the reactor operator (RO) position had the undesired effect of causing the first part of the question to contain a job link to the senior reactor operator (SRO) position. To further explain, the licensee contended that stating in the stem of the question that the misaligned control rod was inoperable, clearly allowed the second part of the question to test knowledge at the RO level because the operability determination was stated in the question. The licensee stated that the only way the control rod could be inoperable would be if it could not move, or was otherwise stuck. The licensee claimed that making such an operability determination, although unintended, tested knowledge required of an SRO, not an RO, because the information was located within the Technical Specification Bases document. The licensee explained that equating "inoperable" to "stuck" was an operability determination with only an SRO job link, not an RO job link. Application of "stuck" was required, according to the licensee, to determine if control rods would automatically respond to reactor coolant system temperature changes.

The licensee also contended that the correct answer was "B", not "D", due to an inoperable control rod always being equivalent to a stuck control rod. The licensee stated that a stuck control rod would immediately generate an URGENT FAILURE when demanded to move, which was an indication that no control rods would automatically respond. The licensee confirmed this in the simulator.

Due to the question being part of the RO portion of the written examination, the licensee was proposing that the question be deleted from the examination based on testing SRO-only knowledge.

#### NRC Discussion:

The question was not written at the SRO level because an untrippable control rod was linked to an inoperable or malfunctioning rod within the Symptoms and Entry Conditions for VCB-AOP-0104, "Rod Control System Malfunction." Furthermore, Technical Specification Bases knowledge was not required because the operability requirements for control rods, as they pertain to the associated one hour action statement, were located within the Surveillance Requirements of LCO 3.1.4, "Rod Group Alignment Limits." However, the examination question should be deleted for reasons discussed below.

The first part of the question forced the applicant to make an assumption on the status of the inoperable control rod. In other words, the stem of the question did not provide enough information to solicit the correct answer, thereby forcing the applicant to make an assumption regarding the nature of the control rod inoperability. There are situations that could exist that could prevent a control rod from moving at its intended speed, thus causing it to become misaligned and generate a ROD DEVIATION ALARM. In this case the control rod could be inoperable but the malfunction could be such that an URGENT ROD CONTROL alarm did not annunciate. If the URGENT ROD CONTROL alarm did not annunciate, then control rods would continue to respond to control RCS temperature. It is also possible for the control rod to be stuck, which would generate an URGENT ROD CONTROL alarm. Control rods will not respond to changes in RCS temperature in the presence of an URGENT ROD CONTROL alarm. Viewing this first part of the question in isolation, both "will" and "will NOT" could be correct,

## Facility Post-Examination Comments and NRC Resolutions

depending on assumptions that the applicant was forced to make on the nature of the control rod inoperability.

The licensee did not contend anything on the second part of the question; however, upon further review, it was determined that the second part of the question did not contain a correct answer. The question asked what action the crew must perform before the time 1100. One of the choices, "restore rod to within alignment limits," was incorrect because it was only required to be performed within eight hours in accordance with Technical Specification 3.1.4, REACTIVITY CONTROL SYSTEMS, which was not within one hour as indicated by the time 1100. The intended correct answer, "verify SDM to be within limits," was also incorrect because it was not required to be performed within one hour if other alternatives were accomplished, such as initiating boration to restore SDM within limit. Since the second part of the question had no correct answer, it was required to be deleted.

Because the first part of the question contained two correct answers and the second part of the question did not contain the correct answer, the question was deleted from the examination.

### **NRC Resolution:**

The answer key was changed to delete this question.



## Facility Post-Examination Comments and NRC Resolutions

### RO QUESTION #62:

#### Comment:

The licensee contended that this question had no correct answer due to a plant design change from baseline five (BL-5) to baseline seven (BL-7). BL-5 training stated that one turbine bearing with vibrations at the alarm setpoint of 7 mils for 30 minutes would cause an automatic turbine trip. BL-5 training also stated that one bearing at the trip setpoint (12 mils) and another bearing at the alarm setpoint (7 mils) would result in an immediate turbine trip. The BL-7 version of AOP-208, "Turbine Malfunctions," was incorrect, in that it still reflected BL-5. The examination developers used AOP-208 to confirm the 30 minute delayed trip when constructing the question; therefore, they thought the plant design had remained unchanged with regards to turbine vibration instrumentation, alarms and setpoints during the BL-7 transition.

After the examination administration, the examination development team learned that the plant had actually changed with respect to turbine vibration instrumentation, alarms and setpoints. BL-7 now included an additional alarm, for a total of three alarm levels: HIGH-1 (7 mils), HIGH-2 (10 mils), and HIGH-3 (12 mils). In accordance with APP-TOS-M3C-100, "TOS Component Control Requirements," if one bearing was above the HIGH-2 setpoint, and a second was above the HIGH-1 setpoint, the turbine would trip immediately. The examination developers also verified that the simulator accurately reflected the BL-7 design as described in APP-TOS-M3C-100.

Based on the new information, an automatic turbine trip signal could have been first generated at time 1016, 1031, or 1046, depending on interpretation of the inadequate alarm presentation as provided in the question. The three alarm levels were supported by plant design documentation to confirm its validity. The licensee proposed that no single correct answer existed.

#### NRC Discussion:

The plant design change from BL-5 to BL-7 impacted the accuracy of the question. Depicting a vibration indication as being in "alarm" was sufficient for the original design information for which the question was developed, but was no longer sufficient for the actual plant design at the time of the examination. Given the current plant design, it was necessary to specify whether the alarm was above the HIGH-1 or HIGH-2 setpoint.

The "Alarm" terminology presented in the as-administered question, with the newfound understanding of the upgraded plant design, was lacking in specificity required to determine when an automatic trip signal was first generated. The more specific terminology of HIGH-1 or HIGH-2 would have been necessary to solicit only one correct answer with respect to the automatic turbine trip signal. The lack of specificity resulted in the applicants being forced to make an assumption as to whether "Alarm" meant HIGH-1 or HIGH-2 for each of the bearings at each of the times. Assumptions could be made that could have led to either time 1031 or 1046 being correct answers (as well as time 1016, although this was not provided as a possible answer choice). The lack of specificity for "Alarm" has resulted in accepting both times 1031 and 1046 as being correct answers.

It was also relevant that an additional alarm, ANY VIB IN TRIP, was also received when the High-3 Alarm was exceeded at 12 mils; therefore, the "Trip" terminology as presented in the as-administered question contained relevant information. Considering the meaning of the word

## Facility Post-Examination Comments and NRC Resolutions

“Trip” as it pertained to turbine vibration alarm presentation, an applicant could deduce that an automatic turbine trip would have occurred at time 1046 or before regardless of whether they assigned a High-1 or High-2 connotation to any of the “Alarm” indications provided. With any vibration in a TRIP status, any other alarm, either HIGH-1 or HIGH-2, would produce an immediate automatic turbine trip signal. This allowed the second part of the question to be retained because the second part of the question asked for whether vacuum was required to be broken subsequent to the automatic turbine trip. Since applicants could ascertain that an automatic turbine trip did occur, they had the ability to continue with the second half of the question, which was predicated on an automatic turbine trip occurring in the first half of the question.

In summary, both times 1031 and 1046 were accepted as correct responses for the first part of the question and the second part of the question remained unchanged. Therefore, “A” and “C” were both correct answer choices.

### **NRC Resolution:**

The answer key was changed to accept both “A” and “C” as correct answers.

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### SRO QUESTION #12:

#### Comment:

The question asked for the time the crew was required to perform compensatory actions and which procedure contained the actions to be performed to support hydrogen igniter operation. The first part of the question was not being debated, 1200 remained the only correct answer for the first part of the question. The second part of the question, which solicited the procedure to be used to support hydrogen igniter operation, was the subject of the post-examination comment.

The licensee contended that the original correct answer remained a valid correct answer choice. They contended that "C" was also correct. The first part of "C" was the same as "D", but they also contended that the second part, AOP-302, "Loss of AC Power," was correct because the actions contained in AOP-302 were intended to support hydrogen igniter operation.

The examination development team originally believed that AOP-303, "Loss of DC Power or AC Instrument Power," actions were used to support hydrogen igniter operations because the procedure explicitly stated so. The team also decided to use AOP-302 as the distractor because that procedure did not provide a reference to supporting hydrogen igniter operation as being the reason to perform the actions within that procedure. However, during the post-examination review it was discovered that VCO-AOP-0302-BKGD, "Background Information for AOP-302, Loss of AC Power," stated that AOP-302, Attachment 1, Step 21, contained actions that ensured hydrogen igniters remained available.

#### NRC Discussion:

The original correct answer, "D," remained valid for the same reasons as documented with the final examination submittal. As stated by the licensee, answer choice "C" was also a correct choice because the background document clearly supported that some actions within AOP-302 were performed to support hydrogen igniter operation.

#### NRC Resolution:

The answer key was changed to accept both "C" and "D" as correct answers.

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### SRO QUESTION #21:

#### Comment:

The licensee proposed that the second part of the question had no correct answer and that SRO question 21 was not a valid question. The licensee contended that VCB-OAP-0100.5, "Guidelines for Configuration Control and Operation of Plant Equipment," did not provide accurate guidance for treatment of invalid alarms. VCB-OAP-0100.5 stated that an invalid annunciator removed for greater than 96 hours would be addressed using either VCB-SAP-0148, "Temporary Bypass, Jumper, and Lifted Lead Control," or VCB-SAP-0300, "Conduct of Maintenance." The licensee stated that the applicants were informed by their training staff that VCB-OAP-0100.5 was based on their operating unit, Unit 1, and the information pertaining to invalid alarms did not apply to Units 2 and 3. The applicants were also instructed that VCB-AOP-0100.5 would be revised later to address methods for the handling of invalid annunciators for Units 2 and 3.

Another issue discovered during the post-examination review was that the procedure series designation had been revised for **NND-OR-0148**, "Temporary Bypass, Jumper, and Lifted Lead Control," by changing it to **VCB-SAP-0148**. The procedure title and content did not change, but the alphabetical pre-fix to the procedure number did change.

#### NRC Discussion:

The licensee's first contention was associated with the second part of the examination question. VCB-OAP-0100.6, "Control Room Conduct and Control of Shift Activities," provided examples for documenting the reason for manual suppression of alarms, which supported the licensee's claim that Units 2 and 3 would employ means other than installing temporary bypasses, jumpers, and lifting leads. This part of the question was not operationally valid because the methods for addressing an invalid alarm as stated in the current procedures were not methods that will be employed on Units 2 and 3.

The licensee's second contention also pertained to the second part of the question and concerned the incorrect alpha-numeric procedure designation for VCB-SAP-0148. This error technically changed the correct answer to "D," based strictly on the fact that **NND-OR-0148**, "*Temporary Bypass, Jumper, and Lifted Lead Control*," was not the correct procedure to use; rather, **VCB-SAP-0148**, "*Temporary Bypass, Jumper, Lifted Lead Control*," was the correct procedure to use.

The incorrect alpha-numeric procedure designation created a challenge to the discrimination validity of the second part of the question. The question failed to adequately test knowledge that could inform a valid decision on whether the applicant possessed the minimum level of competency related to documenting long-term removal of an invalid annunciator. This was evidenced by the realization that an applicant could choose an incorrect answer if they understood that the administrative procedure with the title, "Temporary Bypass, Jumper, and Lifted Lead Control," was the actual procedure to be used for documenting long term removal of a nuisance alarm, but did not give consideration to the change in the alpha-numeric procedure designation. Additionally, an applicant who knew that the procedure number prefix had changed would recognize that the answer choice given in the question with the designator **NND-OR-0148** was not the procedure required to be used for the documentation of removing the nuisance alarm. An applicant could know this for no other reason than understanding that the procedure number prefix had changed, not by knowing the content of the procedure, which was

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the knowledge intended to be tested as required by the randomly sampled question topic (K/A). The discrimination value for the second part of the question was predicated on testing meaningful procedure content within the "Temporary Bypass, Jumper, and Lifted Lead Control," procedure. Incorrectly stating the procedure number prefix circumvented the ability for this part of the question to discriminate between competent and less than competent levels of knowledge as it pertained to documentation requirements for long-term removal of a nuisance alarm.

As part of the overall review of this question it was noted that part one of the question also contained a flaw. Part one asked for the minimum length of time that an alarm could be removed from service that would require documentation outside of normal operator rounds. VCB-OAP-100.5, Section 6.8.2, stated that documentation methods outside of normal rounds would be required for alarms being removed for greater than 96 hours, which was the intended correct answer. However, upon further review, VCB-OAP-0100.5, Section 6.8.1, stated that a Work Order (WO) was required to be initiated to remove a nuisance alarm from service, regardless of the length of time that it would be removed. A WO was also a documentation method that was outside normal operator rounds; therefore, the first part of the question contained two correct answers, in that alarms removed from service for 48 hours and 96 hours would be required to be documented outside of normal operator rounds.

Because the first part of the question had two correct answers and the second part lacked an appropriate amount of operational and discrimination validity, this question no longer discriminated between competent and less than competent as it pertained to operator knowledge. With an unacceptable amount of validity remaining, the question was deleted from the examination.

### **NRC Resolution:**

The answer key was changed to delete this question.