



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

June 16, 2017

Mr. Joseph W. Shea  
Vice President, Nuclear Licensing  
Tennessee Valley Authority  
1101 Market Street, LP 3R-C  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT – NRC OPERATOR LICENSE  
EXAMINATION REPORT NOS. 05000259/2017301, 05000260/2017301,  
05000296/2017301

Dear Mr. Shea:

During the period April 10 – 19, 2017, the Nuclear Regulatory Commission (NRC) administered operating tests to employees of your company who had applied for licenses to operate the Browns Ferry Nuclear Plant. At the conclusion of the tests, the examiners discussed preliminary findings related to the operating tests with those members of your staff identified in the enclosed report. The written examination was administered by your staff on April 25, 2017.

All applicants passed both the operating test and written examination. There was one post-administration comment concerning the operating test. This comment, and the NRC resolution of the comment, is summarized in Enclosure 2. A Simulator Fidelity Report is included in this report as Enclosure 3.

The initial written SRO examination submitted by your staff failed to meet the guidelines for quality contained in NUREG-1021, Operator Licensing Examination Standards for Power Reactors, Revision 10, as described in the enclosed report.

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: 50-259, 50-260, 50-296

License Nos: DPR-33, DPR-52, and DPR-68

Enclosures: 1. Report Details  
2. Facility Comments and NRC Resolution  
3. Simulator Fidelity Report

cc: Distribution via Listserv

SUBJECT: BROWNS FERRY NUCLEAR PLANT – NRC OPERATOR LICENSE  
 EXAMINATION REPORT NOS. 05000259/2017301, 05000260/2017301,  
 05000296/2017301 – dated June 16, 2017

Distribution:  
 B. Caballero, RII  
 E. Guthrie, RII

PUBLICLY AVAILABLE       NON-PUBLICLY AVAILABLE       SENSITIVE       NON-SENSITIVE  
 ADAMS:  Yes      ACCESSION NUMBER: \_\_\_\_\_       SUNSI REVIEW COMPLETE       FORM 665 ATTACHED

OFFICE	RII:DRS	RII:DRS	TTC	RII:DRP	RII:DRS		
SIGNATURE	<b>BLC2 VIA EMAIL</b>	<b>MKM3 VIA EMAIL</b>	<b>MPE1 VIA EMAIL</b>	<b>GXG FOR TAS4</b>	<b>GXG</b>		
NAME	BCABELLERO	MMEEKS	MEMRICH	TSTEPHEN	EGUTHRIE		
DATE	6/ 14 /2017	6/ 15 /2017	6/14 /2017	6/16/2017	6/16/2017		
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket Nos.: 50-259, 50-260, 50-296

License Nos.: DPR-33, DPR-52, DPR-68

Report Nos.: 05000259/2017301, 05000260/2017301, 05000296/2017301

Licensee: Tennessee Valley Authority (TVA), LLC

Facility: Browns Ferry Nuclear Plant, Units 1, 2, and 3

Location: Athens, AL 35611

Dates: Operating Test – April 10 – 19, 2017  
Written Examination – April 25, 2017

Examiners: Bruno Caballero, Chief Examiner, Senior Operations Engineer  
Michael K. Meeks, Senior Operations Engineer  
Matthew Emrich, Senior Reactor Technology Instructor  
Tom Stephen, Resident Inspector (Examiner in training)

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

## **SUMMARY**

ER 05000259/2017301, 05000260/2017301, 05000296/2017301; operating test April 10 – 19, 2017 & written exam April 25, 2017; Browns Ferry Nuclear Plant; 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, §55.43, and §55.45, as applicable.

Members of the Browns Ferry Nuclear Plant staff developed both the operating tests and the written examination. The initial written SRO examination submittal did not meet the quality guidelines contained in NUREG-1021.

The NRC administered the operating tests during the period April 10 – 19, 2017. Members of the Browns Ferry Nuclear Plant training staff administered the written examination on April 25, 2017. All twelve Senior Reactor Operator (SRO) applicants passed both the operating test and written examination. All applicants were issued licenses commensurate with the level of examination administered.

There was one post-examination comment.

No findings were identified.

## REPORT DETAILS

### 4. OTHER ACTIVITIES

#### 4OA5 Operator Licensing Examinations

##### a. Inspection Scope

The NRC evaluated the submitted operating test by combining the scenario events and JPMs in order to determine the percentage of submitted test items that required replacement or significant modification. The NRC also evaluated the submitted written examination questions (RO and SRO questions considered separately) in order to 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. Any questions that were deleted during the grading process, or for which the answer key had to be changed, were also included in the count of unacceptable questions. The percentage of submitted test items that were unacceptable was compared to the acceptance criteria of NUREG-1021, "Operator Licensing Standards for Power Reactors."

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

The NRC administered the operating tests during the period April 10 – 19, 2017. The NRC examiners evaluated twelve Senior Reactor Operator (SRO) applicants using the guidelines contained in NUREG-1021. Members of the Browns Ferry Nuclear Plant training staff administered the written examination on April 25, 2017. Evaluations of applicants and reviews of associated documentation were performed to determine if the applicants, who applied for licenses to operate the Browns Ferry Nuclear Plant, met the requirements specified in 10 CFR Part 55, "Operators' Licenses."

The NRC evaluated the performance or fidelity of the simulation facility during the preparation and conduct of the operating tests.

##### b. Findings

No findings were identified.

The NRC developed the written examination sample plan outline. Members of the Browns Ferry Nuclear Plant training staff developed both the operating tests and the written examination. All examination material was developed in accordance with the guidelines contained in Revision 10 of NUREG-1021. The NRC examination team 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 determined that the licensee's examination submittal was outside the range of acceptable quality specified by NUREG-1021. The initial SRO written examination submittal was outside the range of acceptable quality because more than 20% [7 unsatisfactory of 25] of questions sampled for review contained unacceptable flaws.

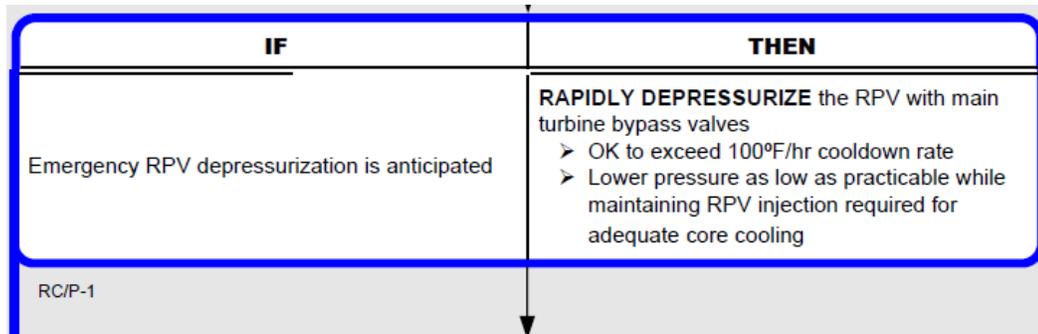
Individual questions were evaluated as unsatisfactory for the following reasons, and future examination submittals need to incorporate lessons learned:

- Four questions failed to meet the K/A statement contained in the examination outline and/or contained two or more implausible distractors.
- Three questions on the SRO examination were not written at the SRO license level.

The NRC determined that the licensee's initial operating test submittal was within the range of acceptability expected for a proposed examination. No issues related to examination security were identified during preparation and administration of the examination.

All applicants passed both the operating test and written examination and were issued licenses.

One generic weakness was identified during the second day of the operating exam, which pertained to nine applicants. While suppression pool level was slowly lowering due to an unisolable leak, none of the crew members discussed, or suggested depressurizing the reactor to the main condenser using the turbine bypass valves, even though the licensee's emergency operating procedure contained the following override:



With an ongoing unisolable suppression pool leak into the reactor building, all the applicants chose to emergency depressurize the reactor early, by directing all the heat to the suppression pool via the ADS valves, even though the main condenser and turbine bypass valves were available. The applicants' decision to depressurize the reactor to the suppression pool, without first considering the condenser, given the slow rate at which suppression pool water level was lowering, unnecessarily challenged the primary and/or secondary containment.

Copies of all individual examination reports were sent to the facility Training Manager for evaluation of weaknesses and determination of appropriate remedial training.

The licensee submitted one post-examination comment concerning the operating test, which may be accessed in the ADAMS system (ADAMS Accession Number ML17132A132). A copy of the final written examination and answer key, with all changes incorporated, may be accessed not earlier than May 13, 2019, in the ADAMS system (ADAMS Accession Number ML17131A200).

4OA6 Meetings, Including ExitExit Meeting Summary

On April 20, 2017, the NRC examination team, and Eugene F. Guthrie, Branch Chief, Operations Branch 2, discussed written and operating test development issues and administrative lessons learned with Lang Hughes, General Manager Site Operations, and Aaron S. Bergeron, Training Director, and members of the Browns Ferry staff. The examiners asked the licensee if any of the examination material was proprietary. No proprietary information was identified.

**KEY POINTS OF CONTACT**Licensee personnel

Russell Joplin, Corporate Exam Program Manager  
 Michael Barton, Lead Exam Developer  
 Keith Nichols, NRC Exam Facility Representative  
 Michael Schulte, Operations Training Instructor  
 Chris Vaughn, Operations Training Manager  
 Aaron S. Bergeron, Training Director  
 Len Slizewski, Operations Superintendent  
 Lang Hughes, General Manager Site Operations  
 Michael Tharpe, Operations Instructor  
 Richard Evans, Initial License Training Class Lead  
 Roger Bond, Operations Instructor  
 Glen E. Pry, Plant Manager  
 Michael W. Oliver, Acting Site Licensing Manager  
 Ryan Coons, Licensing Engineer  
 Jamie Paul, Acting Director Plant Support  
 Donald C. Binkley, Simulator/Exam Team Support

NRC personnel

Eugene F. Guthrie, Branch Chief, Operations Branch 2  
 Tom Stephen, Resident Inspector  
 Dave Dumbacher, Senior Resident Inspector

A complete text of the licensee's post-examination comments can be found in ADAMS under Accession Number ML17132A132. The licensee's post-examination comments were associated with one administrative job performance measure (JPM).

**Conduct of Operations, Administrative JPM #694, Rev. 1, Minimum Staffing – Shift Manager personal emergency, immediately leaves site.**

Post-Examination Comment

For this administrative JPM, the licensee provided three contentions, in the following order:

Contention #1 (JPM Step 5): The licensee contended that the Group 2 Weekly Schedule provided to the applicants contained an additional staffing error, which was not discovered during validation of the JPM. Specifically, the Group 2 Weekly Schedule did not have a senior reactor operator (SRO) available, who could relieve the qualified Shift Technical Advisor (STA) within 10 minutes following entry to an abnormal or emergency operating instruction on any unit. Consequently, the licensee contended that the standard for Step 5 of the JPM needed to be revised to compensate for the additional staffing error, by including a requirement to call-in a SRO, in addition to the SM call-out.

Contention #2 (JPM Step 3): The licensee contended that JPM Step 3 (moving US-5 to the Unit 1 Unit Supervisor position), was not a critical step since Unit 1 and Unit 2 share a common control room, and US-2 was an active SRO, still assigned to Unit 2. The licensee contended that one SRO being present in the combined Unit 1 & 2 control room fulfilled the 10CFR50.54 (m)(2)(iii) requirement, which was required by Tech Spec 5.2.2

Contention #3 (JPM Step 4): The licensee contended that JPM Step 4 to temporarily assign an Incident Commander while awaiting the call-out individuals' arrival, was not critical. The licensee contended, despite the fact that OPDP-1, Attachment 1, Shift Staffing, required the BFN Incident Commander to be a Unit Supervisor (i.e., SRO), that JPM Step 4 (designate one of two Incident Commander qualified ROs to fill the Incident Commander position) was not critical because:

- 1) there was no administrative requirement for temporarily assigning a crew member to fill the Incident Commander (IC) position,
- 2) an actual event occurred in February 2015 when a SRO left the site due to a medical emergency, and the IC role was temporarily filled, for 94 minutes, with an RO who was IC qualified, until a replacement SRO arrived to relieve the RO, and
- 3) the BFN Learning Management System indicated there were currently fourteen ROs at BFN who were listed as qualified ICs.

Background

The following Group 2 Weekly Schedule was provided to the applicants, and the applicants' task was to determine what actions were required to comply with both Tech Spec and Administrative Shift Manning Requirements, for a situation where the Shift Manager (SM) immediately left the site due to a personal emergency, while all three units were operating at 100% power.

Weekly Schedule		
Group 2		
MTWTFSS		
N O O O D D D		
	NOTE	
SM	&	Name \$
US-1		Name \$
US-2	&,*	Name \$
US-3		Name \$
US-4	%,w,s	Name
US-5	*	Name \$
US-6		
US-7		
US-8		
UO		Name
UO	&	Name \$
UO		Name
UO		Name
UO	&	Name
UO	&	Name \$
UO	&	Name
UO		Name

A - SEE LEAVE BOOK
(@) - PERFORM NO LICENSE DUTIES
(b) - BREAK IN NEEDED FOR A/JOURNALS
(d) - CHECK PROFICIENCY LIST FOR BI NEED
(s) - NOT EMERGENCY RESPONDER QUALIFIED
(w) - CHECK MEDICAL RESTRICTIONS
& - MEDICAL OR RESPIRATOR FIT DUE THIS QUARTER
% - BREAK IN REQUIRED TO WORK TS POSITION
* - STA QUALIFIED
(I) - LLRT LEVEL 1 TESTER
(II) - LLRT LEVEL 2
# - NOT SST QUALIFIED
^ - NRC PHONE (JIT)
\$ - INCIDENT COMMANDER QUALIFIED
(1) - PERFORM NO-SOLO LICENSE DUTIES
(2) - NOT FIREWATCH QUALIFIED

- SM SRO, Qualified SM – 10 years experience
- U1 US SRO – 15 years experience
- U2 US SRO – 1 year experience
- U3 US SRO – 10 years experience
- WCC SRO – 20 years experience, medical restriction (can't lift >20 lbs)
- OS/IC SRO – 7 years experience

The exact wording of the initiating cue statement, provided to the applicants, was:

*“You are the Shift Manager (SM) and a personal emergency requires you to immediately leave the site.*

*Review the attached weekly schedule and determine what actions are required to comply with both Tech Specs and Administrative Shift Manning Requirements.”*

When the examiner provided the JPM initiating cue sheet to the applicants, the examiner read the initiating cue statement to all applicants, and told all applicants that they were to assume that the SM was no longer present at the site. None of the applicants asked a question about the JPM while it was being administered.

The as-developed JPM included the following steps, which were all designated as critical steps:

JPM Step 2: Determine that the Unit 1 Unit Supervisor (US-1) must temporarily fill the SM position, because US-1, although not SM qualified, met pre-established OPDP-1 qualification and experience screening criteria to fulfill the SM role during a situation when “the SM was unable to perform SM duties.”

JPM Step 3: Move US-5 to the Unit 1 Unit Supervisor position.

JPM Step 4: Move one of two Incident Commander qualified Unit Operators (Reactor Operators), designated by the "\$" symbol, to the Incident Commander position.

JPM Step 5: Call-out a replacement SM within 2 hours, in accordance with Tech Spec 5.2.2, which allowed the shift crew composition to be less than the 10CFR50.54 requirements for a period of time not to exceed 2 hours, provided immediate action (call-out) was taken to restore the shift crew composition to meet 10CFR50.54 requirements.

### NRC Resolution

The facility licensee did not submit any post exam comments associated with JPM Step 2, and the NRC determined that no changes were needed to JPM Step 2.

The following contentions, including the NRC Resolution to each contention, are listed in the order as presented by the licensee:

- Licensee Contention #1 (JPM Step 5): The licensee contended a previously unidentified STA staffing error was included in the Group 2 Weekly Schedule provided to the applicants, and, therefore, the standard for JPM Step 5 was required to be revised, to call-out an additional SRO, in addition to calling-out a qualified SM, to account for the STA staffing error.

### NRC Resolution to Contention #1 (JPM Step 5): Licensee comment accepted

The Group 2 Weekly Schedule provided to the applicants included an asterisk designation (\*) and a "\$" symbol beside US-2 and US-5; the asterisk meant both individuals were STA qualified, and the "\$" symbol meant they were both also Incident Commander (IC) qualified. However, US-2 was not allowed to fill the IC role, because US-2 was the Unit 2 Supervisor; the IC was not allowed to be a Unit Supervisor assigned to a unit. On the other hand, US-5 was allowed to fill either the STA position, or the IC position, but not both.

The procedural requirements associated with shift staffing at Browns Ferry are implemented, in part, with procedure OPDP-1, Conduct of Operations. Section 3.1.9.A and B of this procedure specified the following:

- A. *The STA function may be fulfilled by manning a separate STA position or by a qualified individual assigned to another shift position.*
- B. *This individual shall be relieved of all non-STA duties and assume the STA advisory role within ten minutes following entry into an Abnormal or Emergency Operating Instruction, on any unit, as required by the instruction.*

Furthermore, OPDP-1, Attachment 1, Shift Staffing, further amplified the above requirements in text associated with Step 1.0.g, which specified the following:

*At BFN, the Incident Commander will be one of the US positions not assigned to a unit or the STA role.*

*The STA may fill the US position provided that an additional SRO (not assigned to a unit or as IC) is available and can relieve the STA filling the US position within 10 minutes. The individual relieving the STA must have knowledge of plant conditions in order to perform a turnover without delay. The STA function is still required upon entry into the Fire Safe Shutdown procedures (FSSs).*

Therefore, given the original shift staffing on the cue sheet, either the STA position or the IC position was not correctly filled, even “before” the JPM began, as detailed below.

One option that the applicants could assume was that US-2 was concurrently filling the STA and Unit 2 Unit Supervisor roles, and US-5 was filling the IC role. If this assumption was used, the Group 2 Weekly Schedule provided to the applicants contained an unidentified crew staffing error because neither US-5 nor US-4 (“%” symbol meant US-4 was inactive) were allowed to relieve US-2.

On the other hand, if the applicants initially assumed that US-5 was filling the STA role, then the IC role was not staffed because no other Unit Supervisor (SRO) could fulfill the IC Role since US-1, US-2, and US-3 were assigned to a unit, and US-4 was neither IC nor emergency responder qualified (“s” symbol).

In either case, the Group 2 Weekly Schedule provided to the applicants did include an additional, unintended crew staffing error associated with the STA or IC role. This crew staffing error did not compromise the operational validity of the JPM because the possibility of a crew staffing oversight was a plausible event.

Therefore, the licensee’s recommendation that the standard for JPM Step 5 was required to be revised, to not only call-out a qualified SM, but also to call out an additional SRO was accepted. Additionally, the standard for JPM Step 5 was also further revised to allow the option of calling out an STA, since an additional STA, for reasons described above, would also solve the unidentified crew staffing error.

- Licensee Contention #2 (JPM Step 3): The licensee contended that reassigning US-5 to the Unit 1 Unit Supervisor position, after the SM left, was not a critical step.

NRC Resolution to Contention #2 (JPM Step 3): Licensee comment accepted

Browns Ferry Units 1 & 2 share a common control room, whereas Unit 3 has a separate control room; therefore, the 10CFR50.54 minimum staffing requirement when all three units are operating at 100% power was three SROs, five ROs, and an additional SRO who is assigned responsibility for overall plant operation at all times there is fuel in any unit (i.e., the Shift Manager). Additionally, in Mode 1, 10CFR50.54 (m)(2)(iii), in part, requires a SRO to be in the control room at all times. After US-1 was selected to temporarily fill the SM position, the 10CFR50.54 requirement for three SROs would still be met with US-2, US-3, and US-5. Therefore, re-assigning US-5 to the Unit 1 Unit Supervisor position was not a required action to meet 10CFR50.54 requirements.

On the other hand, OPDP-1, Attachment 1, Shift Staffing, included more restrictive minimum shift staffing requirements than 10CFR50.54, namely:

	BFN
<b>Shift Manager (SRO)</b>	<b>1</b>
<b>Unit Supervisor (SRO)</b>	<b>4</b>
<b>Unit Operator (UO)</b>	<b>6</b>
<b>Non Licensed (AUO)</b>	<b>9</b>
<b>STA</b>	<b>1</b>
<b>Incident Commander</b>	<b>1</b>

Even after the SM had left the site, there were still FIVE Unit Supervisors (SROs) available to meet OPDP-1 Unit Supervisor shift staffing requirements. After US-1 was temporarily assigned SM duties, the OPDP-1 Shift Staffing requirements were still met because there were still four Unit Supervisors. However, US-4 was inactive (“%” symbol), not emergency responder qualified (“s” symbol), and not STA qualified, therefore, US-4 was not allowed to fill the STA, IC, or Unit Supervisor assigned to a unit roles, but could still fulfill another Unit Supervisor role, such as Work Control Center SRO, for example. There was no administrative requirement to re-distribute US-5 to the Unit 1 Unit Supervisor position; therefore, the licensee’s recommendation that JPM Step 3 was not critical was accepted.

- Licensee Contention #3 (JPM Step 4): The licensee contended that temporarily assigning a RO with Incident Commander qualifications to fulfill the IC role, while awaiting the call-out SRO’s arrival, was not a critical step.

NRC Resolution to Contention #3 (JPM Step 4): Licensee comment partially accepted

OPDP-1, Conduct of Operations, Attachment 1, Shift Staffing, Section 1.0.G stated:

*“At BFN, the Incident Commander will be one of the US positions not assigned to a unit or the STA role.”*

At BFN, the US position was defined as a licensed SRO. Therefore, in accordance with OPDP-1, a RO was not allowed to be IC.

However, the licensee’s Fire Protection Report (0-FPR Volume 1, Part 1), Section 8.1, Fire Emergency Response Organization, stated:

*A site fire brigade five [sic] members (i.e., fire brigade leader and four members) is maintained onsite at all times. The Incident Commander (IC) is a member of the Operations Department that responds to all emergencies in the plant operating areas to evaluate and advise the FBL on firefighting activities affecting Safe Shutdown equipment and other safety related systems. The IC and at least two brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability. The IC shall be competent to assess the potential safety consequences of a fire and advise the control room personnel. Such competency by the IC may be*

*evidenced by possession of an operator's license or equivalent knowledge of plant safety-related systems. The fire brigade shall not include the Shift Manager and the other members of the minimum shift crew necessary for safe shutdown of the unit, nor any personnel required for other essential functions during a fire emergency. The fire brigade composition may be less than the minimum requirements for a period of time not to exceed 2 hours, in order to accommodate unexpected absence, provided immediate action is taken to fill the required positions.*

Assigning one of the two IC qualified ROs to temporarily fill the IC role was not an administrative requirement [**emphasis added**]. Notwithstanding the additional information that the licensee provided in the post exam comments, that

- in February 2015, an RO was temporarily assigned the Incident Commander role for 94 minutes at BFN, while awaiting the arrival of a replacement US to relieve the RO, and
- the licensee's Learning Management System indicated there were fourteen ROs who were listed as qualified ICs,

OPDP-1, Attachment 1 included the administrative requirement which limited the IC assignment to only Unit Supervisors, which was a licensed SRO position at BFN. Therefore, the standard for JPM Step 4 was revised to indicate that designating one of the two IC qualified ROs was NOT allowed, and JPM Step 4 remained a critical step, because ROs were not allowed to be IC per OPDP-1.

In accordance with NUREG-1021, Rev. 10, the final as-administered JPM was annotated with these approved pen-and-ink changes before being entered into ADAMS.

## **SIMULATOR FIDELITY REPORT**

Facility Licensee: Browns Ferry Nuclear Plant

Facility Docket No.: 50-259, 50-260, 50-296

Operating Test Administered: April 10 – 19, 2017

This form is to be used only to report observations. These observations do not constitute audit or inspection findings and, without further verification and review in accordance with Inspection Procedure 71111.11 are not indicative of noncompliance with 10 CFR 55.46. No licensee action is required in response to these observations.

No simulator fidelity or configuration issues were identified.