Post-examination Comments
(Green Paper)

1. Licensee Submitted Post-examination Comments

BRUNSWICK EXAM
50-2003-301
50-325 & 50-324

FEBRUARY 10 - 13 & 19, 2003

CP&L
A Progress Energy Company

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SERIAL: BSEP 03-0038

U. S. Nuclear Regulatory Commission, Region II
ATTN: Mr. Luis A. Reyes, Regional Administrator
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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
NRC OPERATOR LICENSE WRITTEN EXAMINATION – FACILITY COMMENTS

Dear Mr. Reyes:

On February 19 2003, NRC operator license written examinations were administered at the Brunswick Steam Electric Plant (BSEP). In accordance with NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Progress Energy Carolinas, Inc. has performed a post-examination review and is submitting comments for consideration in the grading process.

Enclosure 1 contains comments, recommendations, and references for two questions from the written license examination.

Please refer any questions regarding this submittal to Mr. Leonard R. Beller, Supervisor – Licensing/Regulatory Programs, at (910) 457 2073.

Sincerely,

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NRC Operator License Written Examination - Facility Comments

On February 19 2003, NRC operator license written examinations were administered at the Brunswick Steam Electric Plant (BSEP). In accordance with NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Progress Energy Carolinas, Inc. has performed a post-examination review and is submitting comments for consideration in the grading process. The following comments, recommendations, and references are provided for two questions from the written license examination.

1) RO Exam Question #36/SRO Exam Question #25:

Question:

During an overpressure transient, an operator has opened an SRV to control pressure. RPV pressure is 1005 psig.

Which ONE of the following is the expected tail pipe temperature for the SRV that is open, as indicated on ERFIS?

A. 212 degrees F
B. 300 degrees F
C. 350 degrees F
D. 545 degrees F

Answer from key: B
Reference from Questions Report: Steam Tables

Comment:
The question asks what the expected ERFIS tail pipe temperature indication is for an SRV opened with RPV pressure at 1005 psig. The answer key indicates that "B" is the correct answer (300 degrees). Answer "B" (300 degrees) corresponds to an isenthalpic throttling process from 1000 psig to atmospheric pressure on the Mollier diagram. At the Brunswick Plant, a temperature element is installed in each tail pipe just downstream of the SRV which feeds a recorder, ERFIS, and a common control room annunciator. At the temperature probe location, atmospheric conditions would not exist with an open SRV due to the backpressures created from underwater discharge through a "T" quencher in the torus. The facility recommends the acceptance of Answer "C" (350 degrees) as the correct answer (i.e., not Answer "B"). Per the System Description procedure (SD-20) which discusses temperature indications, the theoretical temperature (indication) is 350°F for steam being throttled through a leaking SRV. This is supported by the annunciator procedure for SRV leaking (or open) which includes SRV temperature alarm setpoints as high as 340 degrees to indicate an open SRV.

Recommendation: Change the correct answer to "C" (350 degrees).

References:
SD-20, Automatic Depressurization System
2APP-A-03, Annunciator Procedures for Panel A-03
SD-25, Main Steam System

2) RO Exam Question #82/SRO Exam Question #77:

Question:

Unit 1 is operating at 100% RTP when a high radiation condition occurs in the Reactor Building. The following conditions exist in the Reactor Building:

Reactor Building Supply and Exhaust Fans	tripped
Both SBGT trains	running
Reactor Building vent isolation dampers (BFIVs)	open
Reactor Building dP	zero

Which ONE of the following describes the impact on the plant due to the above conditions?

A. An elevated release of radioactivity from the main stack could occur.
B. A release of radioactivity outside containment will NOT occur due to both SBGT trains running.
C. A release of radioactivity outside containment will NOT occur since the Reactor Building Supply and Exhaust fans have tripped.
D. A ground level release of radioactivity could occur.

Answer from key: D
Reference from Questions Report: SD 37.1, Rev 4, pg 35, Reactor Building HVAC

Comment:
The question asks for the plant impact from high radiation conditions in the reactor building with a failure of ventilation isolation dampers to close and both standby gas treatment trains (SBGT) running. The answer key provides "D" as the correct answer , (i.e., a ground level release of radioactivity could occur).

The facility recommends acceptance of an additional answer – "A" (i.e., an elevated release of radioactivity from the main stack could occur). This recommendation is based on both SBGT trains running (discharging to the stack) with high radiation conditions in the reactor building. Per the Brunswick Plant Updated FSAR, the SBGT (i.e., SGTS) system provides a means for minimizing the release of radioactive material from containment to the environs by filtering and exhausting the atmosphere from the reactor building during containment isolation conditions. Per the UFSAR, an "elevated release is assured by exhausting to the plant stack." With the SBGT system not 100% efficient in removal of radioactivity, with both systems in operation under high radiation conditions in the reactor building, an elevated release from the stack would result. Therefore, both answers "A" (i.e., an elevated release of radioactivity from the main stack could occur) and answer "D" (i.e., a ground level release of radioactivity could occur) are correct.

Recommendation: Accept both "A" and "D" as correct answers.

References:
BSEP 1 and 2 Updated FSAR Section 6.5.1.1, Standby Gas Treatment System
0OI-37.9, Secondary Containment Control Procedure Basis Document

Attachment to Enclosure 1

Reference Material from the Following Sources:

SD-20, Automatic Depressurization System Description
2APP-A-03, Annunciator Procedures for Panel A-03
SD-25, Main Steam System Description
BSEP 1 and 2, Updated FSAR Section 6.5.1.1, Standby Gas Treatment System
0OI-37.9, Secondary Containment Control Procedure Basis Document

GLM/glm

Enclosure:
NRC Operator License Written Examination – Facility Comments

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3.1.3 Remote Shutdown Panel

SRV solenoid valve red open and green closed lights are provided on the Remote Shutdown Panel. These lights are provided for each of the three manually operated SRVs (B, E, and G). This light indication is from switch position only (and thus the solenoid being energized), not actual SRV position.

3.1.4 Fluid Flow Detector Cabinet, CB-XU-73

The FFD Cabinet has one green closed light, one red open light, and one amber valve open "memory" light for each SRV, all of which are actuated by the acoustic sensor.

3.1.5 Safety/Relief Valve Leaking Indication

Each SRV has a temperature element (TE-B21-N004A, B, C, D, E, F, G, H, J, K, L) installed in its associated discharge piping to detect steam leakage. The response of these temperature elements is recorded in the Control Room on a chart recorder (B21-TR-R614) on Panel H12-P614. A common high temperature alarm, SAFETY OR DEPRESS VLV LEAKING, actuated by this recorder, will annunciate in the Control Room.

In the past several years the 2B21-TE-N004C thermocouple has consistently indicated that SRV 2B21-F013C has a tailpipe temperature that is 60-70°F higher than the average group of SRV thermocouple indicators. EER 93-0428 concluded this is due to the 2B21-F013C thermocouple being physically closer to the SRV main body.

There is only one (1) annunciator to alert operators of a leaking SRV. Any minor leakage from 2B21-F013C which could be acceptably added to this positional effect would exceed the annunciator setpoint of 290°F. This would disable the annunciator from being able to alert operations of a potential leaking SRV (only). Therefore, the setpoint for the Unit 2 annunciator has been changed for 2-B21-F013C from 290°F to 340°F. The 340°F alarm setpoint is still below the theoretical temperature (350°F) for steam being throttled through a leaking SRV. This will prevent the annunciator from alarming needlessly until a leaking SRV exists which warrants operator action.

SAFETY OR DEPRESS VLV LEAKING

AUTO ACTIONS

NONE

CAUSE

1. Automatic or manual initiation of ADS or safety/relief valves.
2. Safety/relief valve failed open.
3. Safety/relief valve(s) not properly seated or the seat is defective.
4. High drywell temperature in vicinity of the safety/relief valve location.
5. Defective Temperature Recorder B21-TR-R614 or incorrect alarm setpoint.
6. Defective Temperature Element B21-TE-N004A, B, C, D, E, F, G, H, J, K, or L.
7. Circuit malfunction.

OBSERVATIONS

1. Safety/relief valve indicating lights on RTGB Panel P601 may indicate valve is open.
2. Safety/relief valve indicating lights on the Fluid Flow Detector Cabinet CB-XU-73 may indicate valve is open.
3. Safety/relief valve leak detection temperature reading greater than 290°F (340°F for B21-F013C only) as read on B21-TR-614 on Control Panel H12-P614.
4. Safety/relief valve noise amplitude reading greater than 0 millivolts on the Fluid Flow Detector Cabinet CB-XU-73.
5. Suppression pool temperature increasing (CAC-TR-4426-1, -2).
6. Primary containment radiation monitors indicating increased activity.
7. Steam flow/feed flow mismatch.

ACTIONS

1. If the cause of the annunciator is automatic or manual initiation of ADS, refer to OP-20, Automatic Depressurization System.
2. If the cause of the annunciator is a safety/relief valve failed open, refer to AOP-30.0, Safety/Relief Valve Failures.
3. If a safety/relief valve is suspected of not being properly seated, cycle the affected safety/relief valve as directed by the Unit SCO in an attempt to reseat the valve.
4. If suppression pool temperature approaches 95°F, place the RHR System in the suppression pool cooling mode per OP-17, Residual Heat Removal System.
5. If a defective temperature recorder, element, or a circuit malfunction is suspected, ensure that a WR/JO is prepared.

DEVICE/SETPOINTS

Temperature Recorder B21-TR-614(SW1)	287-293°F (337-343°F for B21-F013C only)

POSSIBLE PLANT EFFECTS

1. Reactor shutdown.
2. Operation of the RHR System in the suppression cooling mode to maintain suppression pool temperature less than 95°F.
3. Inoperable safety/relief valves may result in a Technical Specification LCO.
4. Increasing suppression pool temperature may result in a Technical Specification LCO.

REFERENCES

1. LL-9364 - 42
2. Technical Specification 3.4.3, 3.5.1, 3.6.2.1
3. OP-17, Residual Heat Removal System
4. OP-20, Automatic Depressurization System
5. AOP-30.0, Safety/Relief Valve Failures
6. EER 93-0428

Each of the SRVs discharge into a tailpipe which directs the effluent to an underwater "T" quencher located near the bottom of the Suppression Pool (-8 ft). The "T" quenchers have three sizes of holes drilled in them to allow for even steam condensing across the T portion. The "T" quencher is designed to divide the steam flow and direct it to the Suppression Pool water volume where the steam is condensed. This results in a relatively slow and uniform heating of the pool water vice a relatively rapid localized heating. Directing SRV discharge to Suppression Pool water volume prevents containment overpressurization which would result from direct discharge to the Drywell air volume. Each SRV tailpipe contains flow and temperature monitoring instrumentation intended to detect valve seat leakage or opening.

The flow detectors (Acoustic Monitors) provide Control Room annunciation, Safety/Relief Valve Open, (A-03 1-10 on P601) while the temperature detectors indicate on Control Room recorder, B21-TR-R614 on Panel P614 and provide annunciation, Safety or Depressurization Valve Leaking (A-03 1-1 on P601).

The SRVs are normally operated from the P601 panel in the relief mode by electrically energizing the solenoids that direct pneumatics to open the valve. The normal pneumatic source is Pneumatic Nitrogen System (PNS) Division I and II while operating and Reactor Non-Interruptible Air (RNA) System Division I and II when shutdown. A Division I and II Backup N_2 supply is provided as a separate pneumatic source for SRVs when PNS/RNA are unavailable. Normal valve position RED-GREEN indication is provided on the P601 panel above the individual valve control switches. This indication is provided electrically from the Acoustic Monitor System. An amber lamp on the P601 panel at each SRV control switch is also activated by the acoustic monitor and seals in until reset. This light provides a memory function to remind/inform the operator of operation of a specific valve. Azimuth locations (Figure 25-1D) of the SRV discharge into the Suppression Pool provide an operator aid on the P601 panel during Emergency Operations.

Seven of the SRVs serve as Automatic Depressurization System (ADS) valves. Their purpose is to Automatically depressurize the reactor vessel thus allowing injection by low pressure emergency cooling sources. These valves are B21-F013 A, C, D, H, J, K, and L and can be manually operated via individual AUTO-OPEN control switches at the P601 panel. Their pneumatic actuation is discussed in the ADS System (SD-20).

6.5 Fission Product Removal and Control Systems

6.5.1 Engineered Safety Feature (ESF) Filter Systems

The ESF filter system is the Standby Gas Treatment System (SGTS) discussed below and the Control Room Emergency Filtration System, which is discussed in Sections 6.4 and 9.4.1.

6.5.1.1 Standby Gas Treatment System.

6.5.1.1.1 Design bases. The principal functions of the SGTS are as follows:

1. Maintain secondary containment below atmospheric pressure when the secondary containment is contaminated.

2. Clean up a contaminated drywell and/or suppression chamber atmosphere when they are being vented to the atmosphere.

3. Provide ventilation and clean up when venting a contaminated drywell after the nitrogen inerting procedure which follows a loss-of-coolant accident (LOCA).

The above functions are consistent with the secondary containment safety objective that is to limit the offsite dose after an accident to a practical minimum and to within 10CFR100 values.

Although not a principal design function, provisions have been made to vent the primary containment through the SGTS at a reduced rate as a backup means of controlling post-LOCA hydrogen generation.

When the SGTS is used as a backup to control post-LOCA hydrogen generation, the flow path of the air will be through one bank of prefilters, two banks of high efficiency particulate air (HEPA) filters, and two banks of charcoal adsorber cells. A source of nitrogen make up is also required for this evolution.

The design bases employed for sizing the filters, fans, and associated ducting are as follows:

1. Each filter train and blower in conjunction with the secondary containment ducting was designed to maintain a negative secondary containment pressure of 0.25 in. of water by controlled venting at the rate of 100 percent volume per day following Reactor Building isolation.

2. The SGTS was designed to withstand the anticipated fission product heat loading from a TID-14844 release without reaching the desorption temperature of the charcoal halogen filters.

3. When operating at nominal rated capacity (3000 scfm), each filter train's moisture separator was designed to operate during secondary containment mode at a maximum ambient condition of 105°F and 50 percent relative humidity.

4. The prefilter was designed to remove large particulates and protect the HEPA filter.

5. The HEPA filters were designed to remove particulates of 0.3 micron size and larger. In-place filters were designed for a minimum of 99 percent efficiency using the standard dioctyl phthalate (DOP) test. The clean pressure drop was designed to be no more than 1 in. water gauge. The filters were designed to be capable of withstanding a moisture loading in the form of mist or fog that would produce a pressure of 10 in. water gauge for 15 minutes; the filters will not suffer permanent damage or a decrease in efficiency after the filters dry out.

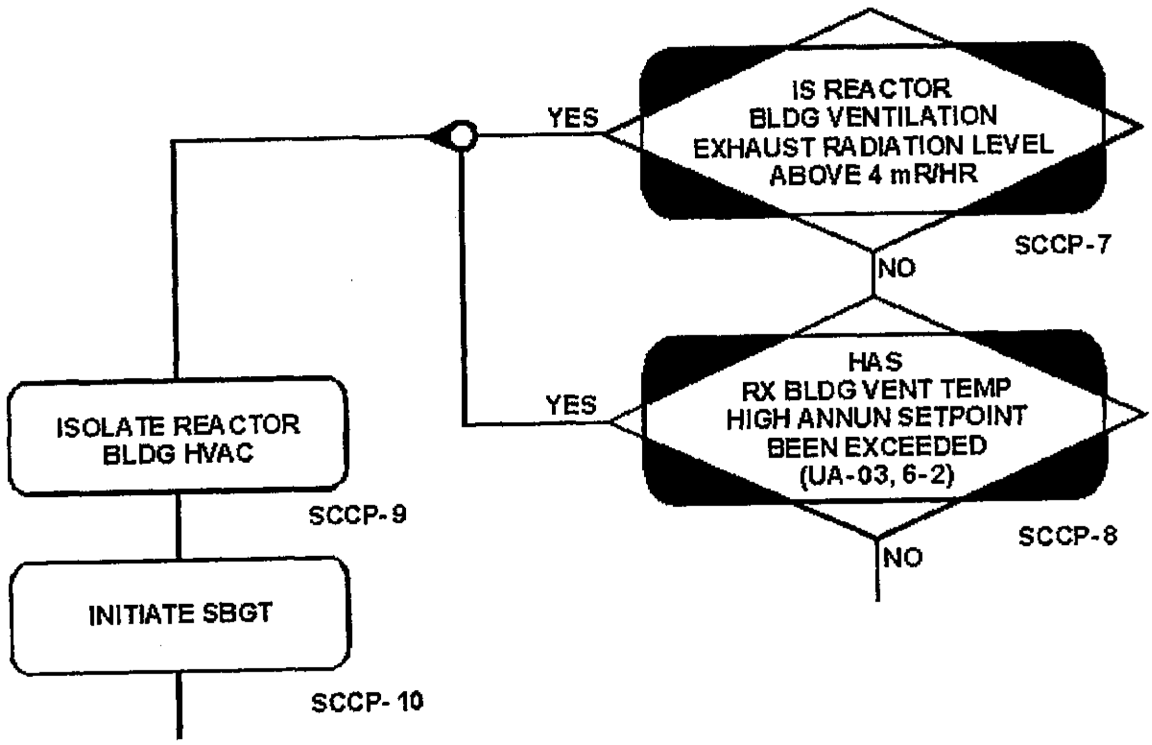
6. The charcoal adsorber unit is capable of removing at least 99 percent of iodine with 5 percent in the form of methyl iodine, CH_3I, under entering conditions of 70 percent relative humidity. Each of the charcoal canisters are filled with impregnated charcoal with an ignition temperature of not less than 340°C (644°F) and a desorption temperature of at least 150°C (302°F).

The ducts, filter trains, blowers, and associated valves were designed to withstand the maximum earthquake without impairing the ability of the system to operate at design capability. The design of the ducts and equipment such as valves and operators, etc., prevents introduction of foreign materials into the air stream.

6.5.1.1.2 System design. The SGTS provides a means for minimizing the release of radioactive material from the containment to the environs by filtering and exhausting the atmosphere from the Reactor Building during containment isolation conditions. Elevated release is assured by exhausting to the plant stack. Provisions have been made for directing the drywell purge air or the pressure suppression chamber vent exhaust to the SGTS if so desired.

The basic system consists of a suction duct, two parallel filter trains and blowers, and a discharge vent. The suction duct draws from Elevation 50 ft into which all areas of the Reactor Building communicate. A normally closed suction is provided for the drywell and the suppression pool which is opened only upon operator action. Each of the two filter trains contains a moisture separator and a heater to provide humidity control, banks of particulate and charcoal filters to remove particulates and halogens, and a blower. Each blower is aligned with a particular filter train. The filter trains and blowers are located in the standby gas treatment (SGT) area which is on Elevation 50 ft of the Reactor Building. The SGT fans discharge through an underground pipe to the 100 meter high plant stack and then to atmosphere. The diagram of the SGTS and the Reactor Building ventilation for Unit 2 is shown in Figure 9-52. The SGTS nominal flow rate is 3000 scfm. This flow can be obtained with each blower operating with the corresponding filter train. Acceptable higher flow rates, up to the maximum analyzed flow of 4200 CFM, may be obtained during unthrottled system operation.

STEPS SCCP-7 through SCCP-10



STEP BASES:

Since instrumentation to read the 135° F is not available, the operator is directed to use the annunciator (setpoint of 135° F).

If the reactor building ventilation exhaust radiation level is above 4 mR/hr, then the Reactor Building HVAC should have automatically isolated. This step ensures that a required automatic function has initiated. Confirming isolation of Reactor Building HVAC subsequent to receipt of a high radiation signal or a high temperature condition terminates any further release of radioactivity to the environment from this system.

SBGT is the normal mechanism employed under post transient conditions to maintain reactor building pressure negative with respect to the atmosphere since the exhaust from this system is processed and directed to an elevated release point before being discharged to the environment.