Susquehanna Post Exam Comment Submittal & Disposition

ATTACHMENT 2

Licensee's Post Written Examination Comments Publically Available ADAMS Accession No. ML12

Following the administration of the written examination on January 23, 2012, the licensee submitted post exam comments for three written exam questions (i.e., RO 69, SRO-79 and SRO 86) that received by the NRC on February 7, 2012. During the exam there were no questions asked by the applicants regarding these three questions. The NRC's resolution for these post exam comments is based on the independent reviews that were conducted by all three of the NRC examiners assigned to the exam team as well as the Branch Chief.

RO QUESTION 69

Question

Operator A has just removed a Clearance that required Operator B to hold a ladder for 2 of the 10 tags on the clearance. The System Operating Representative is ready to have the Clearance removal Independently Verified (IV).

To independently verify the Clearance removal, the System Operating Representative may use:

A. Operator B, as long as the verification is performed on a different day

B. Operator B for all 10 components

C. Operator B for the 8 tags he did not assist with and Operator C for the remaining 2

D. Neither Operator A nor Operator B

Answer Explanation

A is incorrect. Regardless of separation of time, both Operator A and Operator B were either the performer or in close proximity to the performer, contrary to NDAP–QA–0027

B is incorrect. Operator B was in close proximity during positioning of two components, not eligible to be independent verifier per NDAP–QA–0027 for those two components, but not all ten.

C is correct. Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.

D is incorrect. Operator A cannot be his/her own verifier, but Operator B can verify those tags which he/she did not assist with or reposition.

Examination Analysis

Only 1 of 4 applicants selected an incorrect answer to the question.

Recommended Change

Accept distractor D as a second correct answer to the question, in addition to the original keyed answer C.

Justification For Change

The keyed answer for this question is C, and was justified with procedure NDAP–QA–0027. Section 2 of NDAP–QA–0027 provides the following requirements for the extent of a Independent Verifier's involvement with performance of an activity:

> *...The individual performing the verification physically checks the component's condition* ***without relying on observation of*** or verbal confirmation by ***the performer...*** [emphasis added]

NDAP–QA–0027, Section 2 does allow personnel to perform Independent Verification (IV) of activities in which the personnel have participated, with certain restrictions:

> *The verifier cannot be directly involved in an activity while it is being performed. It is, however, acceptable for an individual involved with a test or evolution to perform an IV for an activity within the test or evolution* ***as long as that individual is not present while the activity is performed****.* [emphasis added]

Combining the information in the stem with the additional information presented in distractor C, the scenario assumed in the answer justification meets the requirements of NDAP–QA–0027, and distractor C remains a correct answer.

NDAP–QA–0027 contains additional requirements for verification of clearance order removal beyond those associated with the method to perform Independent Verification. Specifically, Section 6.1.2 specifies verification requirements for removal of clearance orders:

> *6.1.2 Blocking under the Energy Control Process (Clearance Orders)*
>
> *a.* ***Application and removal of blocking*** *on any component, safety related or not,* ***requires Concurrent Verification****.* [emphasis added]
>
> *b. Restoration from blocking on Safety Related Systems requires Independent Verification.*

The process of performing Clearance Order (CO) removal is described in NDAP–QA–0322, Energy Control Process. The method for performance of Concurrent Verification of Clearance Order (CO) removal is described in Section 6.12 and Attachment I of NDAP–QA–0322:

> *6.12.4 SOR [System Operating Representative] shall Utilize Attachment E to* ***brief Switchman AND Concurrent Verifier*** *on removing Clearance Order and procedure for restoration of equipment.* [emphasis added]
>
> *6.12.5* ***Switchman and Concurrent Verifier shall*** *Utilize Attachment I, to remove Clearance Order and restore equipment.* [emphasis added]

Attachment I

8. ***The Concurrent Verifier verifies items above for all EIDs*** *[Energy Isolating Devices] and documents concurrent verification for EIDs not requiring independent verification.* [emphasis added]

The procedure requires two Operators (Switchman and Concurrent Verifier in NDAP–QA–0322 parlance) be briefed and then work together for the removal of a Clearance Order (i.e., to remove the CO and perform Concurrent Verification). A third Operator then performs Independent Verification of the removal of the CO when required.

The stem of the question does not provide all the information necessary to answer the question addressing the procedure requirements for both Concurrent Verification and Independent Verification of Clearance Order removal. The stem states that a Clearance Order being removed by Operator A (i.e., "Switchman") required a second operator (Operator B) to hold a ladder for 2 out of the10 tags. The question stem does not specifically address how the requirements of NDAP–QA–0027 and NDAP–QA–0322 for Concurrent Verification of CO removal is being satisfied. That is, the stem and question do not specify whether Operator B (the assumed Concurrent Verifier) did or did not concurrently verify the entire Clearance Order with Operator A (the Switchman) as would be expected per normal operating practices and in accordance with plant procedures. This critical information was not contained in the question's stem, and could only be inferred from information contained in the C distractor. Since a third operator is not mentioned in the stem, it is reasonable to assume that Operator B was the Concurrent Verifier required by NDAP–QA–0027 and NDAP–QA–0322 for removal of the entire CO and that no ladder was required during removal of the other 8 tags on the CO.

Based solely on the information provide in the stem and not any additional information contained in any distractor, along with knowledge of the procedural requirements for Concurrent Verification of Clearance Order removal, it is reasonable to assume that Operator A and Operator B completed removal of the entire Clearance Order together. Therefore <u>neither</u> Operator A nor Operator B could be used for the Independent Verification making distractor D a correct answer:

D. Neither Operator A nor Operator B

It is the recommendation of SSES to accept D as a second correct answer to this question. Distractor C remains a correct answer as justified in the original submittal. Choices A and B remain incorrect as explained in the original submittal.

<u>References</u>

NDAP–QA–0027, "Station Component Verification Requirements"

NDAP–QA–0322, "Energy Control Process"

NRC Resolution for RO Question #69:

The NRC conducted detailed reviews of all the references provided and concluded that the NRC accepts the licensee's recommendation to accept both "C" and "D" as correct answers to this question.

The NRC agrees that the original designated correct answer "C" is still a correct answer. Susquehanna's procedure NDAP-QA-0027, "Station Component Verification Requirements", Section 2 does allow personnel to perform Independent Verification (IV) of activities in which they have participated, with certain restrictions, "...The verifier cannot be directly involved in an activity while it is being performed. It is, however, acceptable for an individual involved with a test or evolution to perform an IV for an activity within the test or evolution as long as that individual is not present while the activity is performed." In addition, the guidance in NDAP-QA-0027, Attachment C, section 2, "At Risk Practices to Avoid' section 2.1, "Independent Verifier in close proximity at the time of the performing acts.", would preclude Operator B from being the independent verifier for the two tags on the clearance for which he held the ladder for Operator A but it would not preclude him from acting as the independent verifier for the eight tags for which he did not assist Operator A. Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.

Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.
Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.
Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.

Combining the information in the question stem with the additional information presented in answer choice C, the situation presented assumed that the extent of Operator B's involvement was limited to the two tags on the clearance for which he held the ladder for Operator A and this meets the requirements of NDAP-QA-0027, and distractor C remains a correct answer.

The NRC agrees that answer choice "D" could also be a correct answer. The guidance in NDAP-QA-0027, Section 6.1.2, requires concurrent verification for removal of blocking on any component, and for restoration of blocking on safety related systems it also requires Independent Verification. In addition, the process for performing Clearance Order (CO) removal is described in NDAP-QA-0322, "Energy Control Process" section 6.12 and Attachments E and I. Attachment E is used to brief the Switchman and Concurrent Verifier on removing the CO and the Attachment I checklist is used by the Switchman and Concurrent Verifier for guidance in restoring the CO and equipment. These procedures require two Operators (i.e., a Switchman and Concurrent Verifier) be briefed and then work together for the removal of a Clearance Order (i.e., to remove the CO and perform Concurrent Verification). Removal of a CO from a safety related system would also require a third Operator to perform Independent Verification. The question stem states that a Clearance Order was just removed by Operator A (i.e., Switchman) and required a second operator (Operator B) to hold a ladder for 2 out of the 10 tags. The question stem does not specifically address how the Concurrent Verification requirements of NDAP-QA-0027 and NDAP-QA-0322 are being satisfied. The question stem does not specify whether Operator B did or did not concurrently verify the entire Clearance Order with Operator A (the Switchman) as would be expected in accordance with plant procedures. The NRC agrees that given the guidance in NDAP-QA-0027 and NDAP-QA-0322, it is reasonable to assume based solely on the information provided in the question stem that Operator A and Operator B

completed removal of the entire Clearance Order together making distractor "D" also a correct answer.

In summary, the NRC has concluded that both "C" and "D" are correct answers to this question and Choices "A" and "B" remain incorrect.

SRO QUESTION 79

Question

Given the following conditions:

- Unit 1 ATWS in progress
- Initial ATWS power 4%
- RPV Pressure is 1000 psig, down slowly
- Suppression Pool level is 21 feet, up slowly
- Suppression Pool temperature is 180° F, up slowly

Given the Heat Capacity Temperature Limit (HCTL) curve, select the necessary corrective action in accordance with EO–100–113, "Level/Power Control".

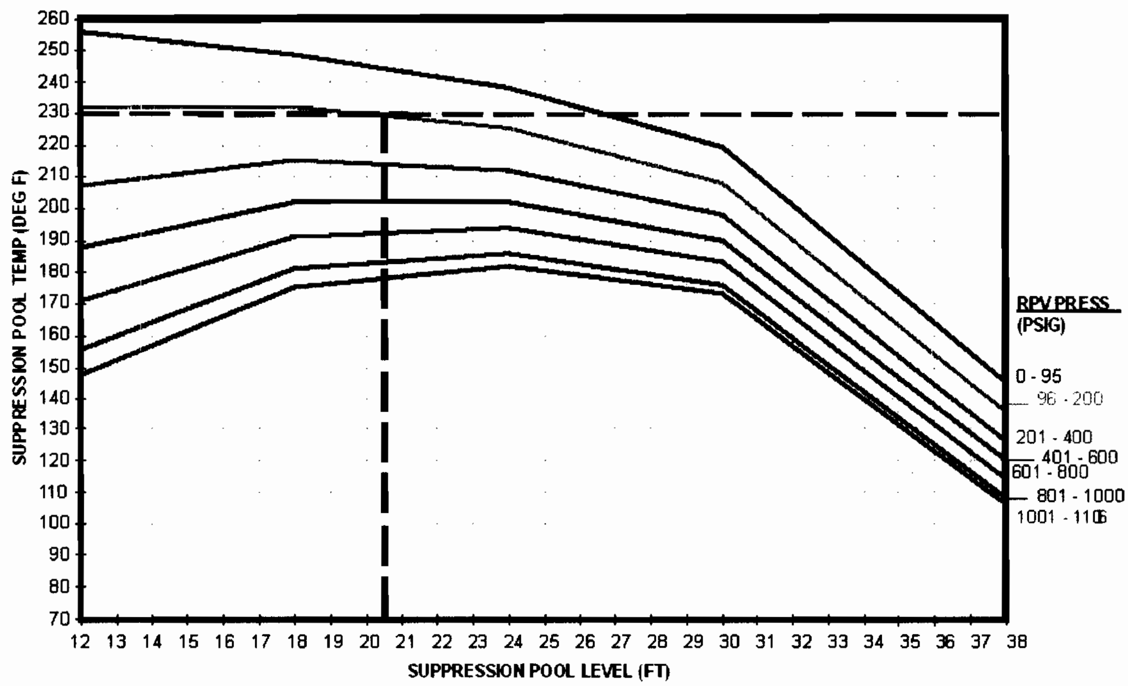
A. Perform EO–100–112, Rapid Depressurization

B. Anticipate Rapid Depressurization by opening all BPV irrespective of cooldown rate

C. Use BPVs to maintain RPV pressure below HCTL, not to exceed 100° F/hr

D. Use BPVs to maintain RPV pressure below HCTL, exceeding 100° F/hr if necessary

FIG 2 HCTL
HEAT CAPACITY TEMPERATURE LIMIT



Answer Explanation

A is incorrect. While Rapid Depressurization is permissible with an ATWS in progress if initial ATWS power <5%, HCTL has not yet been exceeded.

B is incorrect. RPV Pressure reduction is permitted per LQ/P–4 to maintain RPV Pressure below HCTL. Use of bypass valves to rapidly depressurize the RPV if a Rapid Depressurization is anticipated is not permitted while in EO–100–113 Power/Level Control. This is permitted in EO–100–102 RPV control (RC/P–3), however, EO–100–102 RPV control is exited once EO–100–113 is entered for the ATWS. The "BPV" symbol accompanies step SP/T–8 in EO–100–103 and is not an instruction; it is attached to step SP/T–8 as a visual *reminder* of an existing instruction at RC/P–3. If the RPV Control procedure is not in use, no permission is given to use the bypass valves. Note, the bypass valve override is not located in EO–000–113, Level/Power Control. Applicants may confuse this and mistakenly believe that this authorizes them to anticipate Rapid Depressurization and open all BPV with an ATWS in progress.

C is incorrect. HCTL is not currently exceeded, but the limit is being approached. RPV Pressure reduction is permissible during an ATWS to prevent exceeding HCTL if the initial ATWS power <5%; exceeding cooldown rate limits is permitted.

D is correct. HCTL is not currently exceeded, but the limit is being approached. IAW EO–000–113 step LQ/P–4, RPV Pressure reduction is permissible during an ATWS to prevent exceeding HCTL if the initial ATWS power <5%; exceeding cooldown rate limits is permitted.

Examination Analysis

Only 1 of 2 SRO applicants selected an incorrect answer to the question.

Recommended Change

Accept distractor A as a second correct answer to the question, in addition to the original keyed answer D.

Justification For Change

The original correct answer for this question is "D" and was justified with procedure EO–000–113 step LQ/P–4, which states:

> ***IF*** *INITIAL ATWS PWR ≤* ***5%***
> *AND*
> *SUPP POOL TEMP AND LVL CANNOT BE MAINTAINED BELOW FIG* ***2*** *HCTL*
>
> *MAINTAIN RPV PRESS BELOW LIMIT EXCEEDING COOLDOWN RATE IF NECESSARY*

The keyed answer to the question presumes that Turbine Bypass Valves may be used to reduce reactor pressure, thereby raising the HCTL limit curve in effect and providing more margin. As the question stem does not specifically eliminate Turbine Bypass Valve availability, the original answer justification is unchanged and D is still a correct answer.

The conditions in the stem also support the conclusion that Turbine Bypass Valves are **not** available. This is due to the very high Suppression Pool temperature of 180 °F with an initial ATWS power level of only 4% rated power, which is well within capacity of the Turbine Bypass Valves. From TM–OP–083–ST

> *The Main Steam System also provides for bypassing reactor steam to the condensers during startup and anytime the quantity of steam produced by the reactor is more than required by the turbine generator. The bypass system can bypass approximately 22 percent of rated steam flow.*

If Turbine Bypass Valves were available the steam would be going to the condenser and Suppression Pool temperature would be significantly lower. Therefore, it can be assumed that reactor pressure is being controlled using SRVs as main steam line drain capacity cannot maintain pressure in a 4% power ATWS.

As an additional confirmation of Turbine Bypass Valves being unavailable, the question stem specifies RPV Pressure is 1000 psig and slowly lowering This is not the expected reactor pressure response for Turbine Bypass Valve normal operation post–scram. Step 5.55 of GO–100–002, Plant Startup, Heatup and Power Operation, specifies the following for setup of EHC during reactor startup:

> *5.55 Slowly Adjust EHC Pressure Setpoint in order to close the Main Turbine Bypass Valves, maintaining Pressure Setpoint 50–100 psig greater than Reactor Pressure up to the required final setting required to achieve the desired final RPV Pressure of 934 psig.*

With EHC Pressure Setpoint at 934 psig, there is sufficient Turbine Bypass Valve capability for a 4% initial power ATWS to maintain reactor pressure stable and near the 934 psig Pressure Setpoint, well below the 1000 psig reactor pressure specified in the stem of the question. Based on this normal plant line–up and the current plant conditions listed in the stem, it is apparent that Turbine Bypass Valves are not controlling reactor pressure as expected.

Step LQ/P–4 bases in EO–100–113 states the following regarding use of Safety Relief Valves (SRV) for maintaining HCTL in an ATWS condition:

> *If SRVs are used to maintain RPV pressure below the HCTL, the margin to the limit will not improve; that is, the delta between containment parameters and the HCTL will not increase. This is because SRV use adds heat to the suppression pool, and suppression pool temperature is one of the three factors that is included in the HCTL.*

The limit curve in effect on the HCTL graph is for 801–1000 psig based on current conditions from the stem. Despite the lowering trend in reactor pressure, a significant reduction in pressure (200 psi) is required to reach the next lower limit curve and provide additional margin to exceeding HCTL.

From the conditions in the stem step SP/T–2 of EO–100–103 is applicable, which states

WHEN *SUPP POOL TEMP CANNOT BE MAINTAINED < **90°F***

MAXIMIZE SUPP POOL COOLING UNLESS RHR PUMPS CONTINUOUSLY NEEDED FOR ADEQUATE CORE COOLING

With reactor pressure at 1000 psig RHR pumps are not continuously needed for adequate core cooling. RHR should be available to be placed in service in the Suppression Pool cooling mode with cooling maximized. A Suppression Pool temperature of 180° requires either a fault in one or both divisions of RHR that prevent placing Suppression Pool cooling in–service, or credit the assumption that the energy deposition into the Suppression Pool exceeds the capability of RHR in the Suppression Pool cooling mode.

Procedure OP–AD–055, Operations Procedure Program, Step 4.3, provides this definition of Cannot Be Maintained to be applied in EOP execution:

> *...The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter cannot be maintained above or below a specified limit neither requires nor prohibits anticipatory action – depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached...*

Given the conditions in the stem no means of lowering Suppression Pool temperature is available. From the rising trend in Suppression Pool temperature and the small margin to the curve it is apparent that the HCTL curve will be exceeded. Per the EO–100–113 bases for step LQ/P–4 SRVs will not be effective in restoring HCTL margin. Under these conditions the appropriate determination is that Suppression Pool level and Suppression Pool temperature **cannot be maintained** below HCTL.

Since initial ATWS power level is <5%, EO–100–103 step SP/T–5 allows proceeding with the Suppression Pool temperature control leg:

WHEN *INITIAL ATWS PWR ≤* ***5%***
OR
RX SHUTDOWN WITH CONTROL RODS

CONTINUE

Suppression Pool Temperature Leg step SP/T–8 directs Operators to perform a Rapid Depressurization IAW EO–100–112:

WHEN *RPV PRESS*
SUPP POOL TEMP AND
SUPP POOL LVL
CANNOT BE MAINTAINED BELOW
FIG ***2*** *HCTL*

RAPID DEPRESS IS REQ'D

To implement the Rapid Depressurization under ATWS conditions, actions are also required in the Power/Level Control contingency procedure EO–100–113. The override in step LQ/L–10 of EO–100–113 is applicable under the ATWS conditions described in the stem:

IF *RAPID DEPRESS REQ'D*

GO TO LQ/L 18

Execution of the override requires additional steps in EO–100–113 to be performed, prior to initiating the Rapid Depressurization per EO–100–112. This includes the significant action of terminating and preventing injection into the reactor as specified in Step LQ/L–18:

STOP INJECTION
AND
PREVENT INJECTION

FROM:

- *FW*
- *COND*
- *LPCI*
- *CORE SPRAY*

This step prevents uncontrolled injection of large amounts of cold water as RPV pressure decreases below the shutoff head of operating system pumps and reduces the possibility that large reactor power excursions and subsequent core damage occur during the depressurization.

Knowledge of the significant actions to be performed in EO–100–113 to support the Rapid Depressurization makes distractor A a correct answer to the question of the corrective action required per EO–100–113:

A. Perform EO–100–112, Rapid Depressurization

It is the recommendation of SSES to accept A as a second correct answer to this question. Choice D remains a correct answer as justified in the original submittal. Choices B and C remain incorrect as explained in the original submittal.

References:

EO–000–103, Primary Containment Control

EO–000–113, Power / Level Control

OP–AD–055, Operations Procedure Program

GO–100–002, Plant Startup, Heatup And Power Operation

NRC Resolution for SRO Question #79:

The NRC conducted detailed reviews of all references provided and concluded that the NRC accepts the licensee's recommendation to accept both "A" and "D" as correct answers to this question.

The NRC agrees that the original designated correct answer "D" is still a correct answer. Given the plant conditions in the question stem, HCTL is not currently exceeded, but the limit is being approached. In accordance with EO–000–113, "Power/Level Control" step LQ/P–4, RPV Pressure reduction is permissible during an ATWS to prevent exceeding HCTL if the initial ATWS power <5%; exceeding cool down rate limits is permitted. In addition, the bases document for EO-100-102, "RPV Control" step RC/P-5 states:

> SRVs should not be used to maintain RPV pressure below the HCTL because the margin to the limit will not improve; that is, the delta between containment parameters and the HCTL will not increase. This is because SRV use adds heat to the suppression pool, and suppression pool temperature is one of the three factors that is included in the HCTL. Other methods of RPV depressurization that discharge energy outside primary containment, such as BPV's, and HPCI in CST to CST mode, reduce RPV pressure without adding all the energy to the suppression pool, thereby increasing margin to the limit.

In this case, it is preferable to use the bypass valves, if possible, to accomplish reactor vessel depressurization. As the question stem does not specifically eliminate turbine bypass valve availability (e.g. using the turbine bypass valve jack to manually open the turbine bypass valves as necessary), the original answer justification is unchanged and D is still a correct answer.

The NRC agrees that answer choice "A" could also be a correct answer. Based upon the conditions given in the stem of the question, it is reasonable to conclude that the bypass valves are unavailable based upon expected system response. Given the 4% initial power ATWS, normal EHC Pressure system response (i.e., with 22% bypass capacity) would maintain reactor pressure at 934 psig, well below the 1000 psig reactor pressure specified in the stem of the question. Additionally, suppression pool temperature is 180°F and rising slowly is another indication that bypass valves are not functioning and safety relief valves (SRVs) have cycled discharging energy into the suppression pool with no effective means of heat removal.

In addition, from the conditions in the question stem step SP/T–2 of EO–100–103 is applicable, with suppression pool temperature greater than 90F suppression pool cooling should have been maximized. A suppression pool temperature of 180° would indicate either a fault in one or both divisions of RHR preventing or limiting suppression pool cooling to the extent that the energy deposition into the suppression pool exceeds the capability of the Residual Heat Removal (RHR) system in the suppression pool cooling mode causing suppression pool temperature to continue to rise.

Given the conditions in the stem with a lack of expected EHC system response, a rising trend in suppression pool temperature, and a small margin before exceeding Heat Capacity Temperature Limit (HCTL) curve and considering the EOP guidance (i.e., EO-100-103, steps SP/T-5 and SP/T-8; EO-100-113, override in step LQ/L–10 to perform Step LQ/L–18), it is reasonable to conclude that suppression pool temperature cannot be maintained below the HCTL requiring performance of EO–100–112, Rapid Depressurization which makes answer choice "A" also a correct answer.

In summary, the NRC has concluded that both "A" and "D" are correct answers to this question and choices "B" and "C" remain incorrect.

SRO QUESTION 86

Unit 1 was at 100% when the following conditions occur:

- A transient occurred that has caused Suppression Pool Level to rise.
- Attempts to Lower Suppression Pool level in accordance with OP–159–001 Suppression Pool Cleanup System were unsuccessful.
- HPCI and RCIC were placed on MIN Flow at 25 feet in the Suppression Pool.
- At 35 feet in the Suppression Pool level, Rx SCRAM was performed IAW ON–100–101 and EO–100–102, RPV control was entered at step RC–1.
- Suppression Pool Level is now 35.5 feet and rising slowly.

In accordance with EO–100–103, "PC Control", which one of the following steps would be correct and why?

A. Open ALL BPVs because drywell vacuum breakers are beginning to become submerged.

B. Rapid depressurization because drywell vacuum breakers are beginning to become submerged.

C. Open ALL BPVs to depressurize the RPV prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

D. Rapid depressurization prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

Answer Explanation

A. **Incorrect but plausible:** Plausible, partially correct that if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve may be used to depressurize the RPV until the rapid depressurization limit, “38 Feet” is reached. Note that 38 feet is not yet reached, however, the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports. At 43’ the drywell vacuum breakers begin to cover.

B. **Incorrect but plausible:** Plausible if the applicant does not recall rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve may be used to depressurize the RPV until the rapid depressurization limit, “38 Feet” is reached. Note that 38 feet is not yet reached.

C. **Correct:** Rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve should be used to depressurize the RPV until the rapid depressurization limit, “38 Feet” is reached. Note that 38 feet is not yet reached, the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports.

Note: HPCI and RCIC were placed in min flow because EO–100–103, requires HPCI and RCIC to be started prior to reaching 25’, because if pool level were above 25’, water could enter the exhaust piping and a high exhaust pressure

would occur when the system is started due to inertial effect of water in the piping. This could potentially cause the system to trip on high turbine exhaust pressure. Therefore, both HPCI and RCIC are ensured to be running when pool level reaches 25'.

D. **Incorrect but plausible:** Plausible, partially correct that if the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports, however if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve should be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached.

<u>Examination Analysis</u>

Both SRO applicants selected an incorrect answer to the question.

<u>Recommended Change</u>

Accept distractor D as a second correct answer to the question, in addition to the original keyed answer C.

<u>Justification For Change</u>

The original correct answer for this question is C and was justified with procedure EO–100–103 step SP/L–14, the bases for which states:

> *If rapid depressurization is anticipated and the reactor is shutdown on control rods, Main Turbine Bypass Valves may be used to depressurize the RPV until the rapid depressurization limit, "38 feet," is reached.*

The original answer justification is unchanged, and distractor C is still a correct answer.

Choice D was originally justified as wrong with this statement:

> *Plausible, partially correct that if the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports, however if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve* ***should*** *be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached.* [emphasis added]

The stem of the question asks for the "correct action" to take per EO–100–103 in response to an ongoing transient that has resulted in a Suppression Pool level high enough to warrant reactor scram, with pool level continuing to rise. The nature of the transient causing the rising Suppression Pool level is not described in the stem of the question. The in-leakage into the Suppression Pool must be severe, to raise level over 11 feet above normal operating levels. This represents an influx of over 440,000 gallons.

The stem states that the reactor was scrammed at 35 feet in the Suppression Pool. A reactor scram is inserted in EO–100–103 Step SP/L–13 in anticipation of a Rapid Depressurization:

Performing a reactor scram in accordance with ON–100–101 (ON-200-101) and, entering EO–000–102 at step RC–1 assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before direction is given to depressurize the RPV.

This action was taken conservatively, based on the 3 foot margin to the Suppression Pool high–level Rapid Depressurization limit. Following the scram an additional influx of 20,000 gallons has occurred based on the additional 0.5 foot rise in pool level, and pool level continues to rise. Given the continuing rise in Suppression Pool level and that previous attempts to lower Suppression Pool level failed, the in-leakage into the Suppression Pool continues post–scram and no viable method of stopping the in-leakage or lowering Suppression Pool level exists.

EO–100–103 step SP/L–14 states:

WHEN *SUPP POOL LVL CANNOT BE MAINTAINED < **38'***

1 RAPID DEPRESS IS REQ'D
2 CONTACT TSC TO ENTER EP DS 002 RPV AND PC FLOODING

The bases of this step indicate that equipment damage is possible due to SRV operation at this Suppression Pool level:

At levels above 38', challenges occur with respect to component operability and primary containment structural integrity. For example, at 38' operation of an SRV at its lowest relief setpoint may result in exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports.

Procedure OP–AD–055, Operations Procedure Program, Step 4.3, provides this definition of Cannot Be Maintained to be applied in EOP execution:

...The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter cannot be maintained above or below a specified limit neither requires nor prohibits anticipatory action – depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached...

Given the severe in-leakage into the Suppression Pool, that the in-leakage continues, and that efforts undertaken to reduce Suppression Pool level have failed, it is apparent that the limit will ultimately be exceeded. With the declaration that Suppression Pool level cannot be maintained less than 38 feet, Rapid Depressurization is required per EO–100–103 step SP/L–14.

The stem specifically asks what action is correct per EO–100–103. The Bypass Valve "reminder" symbol that allows depressurization with Bypass Valves is located in EO–100–103 on step SP/L–14. The bases for step SP/L–14 in EO–100–103 provide this additional clarification on the requirements for use of the Turbine Bypass Valves in this situation

The "BPV" symbol is not an instruction; it is attached to step SP/L–14 as a visual reminder of an existing instruction at RC/P–3.

The bases for step RC/P–3 in EO–000–102 provide the following guidance for use of Turbine Bypass Valves in anticipation of Rapid Depressurization:

> *"Anticipated" implies an expectation that an emergency RPV depressurization requirement cannot be averted by actions prescribed in the EOPs and <u>will soon be reached</u>. The expectation must be based on:*
>
> 1. *An evaluation of plant conditions which includes an extrapolation of parameter trends…*
>
>   *… The words "cannot be maintained" neither require nor prohibit anticipatory action. Depending upon plant conditions, rapid depressurization **may be performed as soon as it is determined that the limit will ultimately be exceeded**, or delayed until the limit is actually reached…*[emphasis added]

While EO–100–102 indicates a preference for use of the Turbine Bypass Valves, plant conditions must be established to support the depressurization. With the reactor scrammed EO–100–102 Step RC/P–1 must be evaluated for applicability.

IF *ADEQUATE CORE COOLING IS ASSURED*

BEFORE *DEPRESSURIZING **< 700 PSIG***

PREVENT UNCONTROLLED COND INJECTION

As the conditions in the question do not indicate concerns for adequate core cooling, the condensate system must be aligned to prevent uncontrolled injection before lowering reactor pressure below 700 psig using Turbine Bypass Valves. The bases for step RC/P–1 specify the normal means of aligning condensate prior to use of the Turbine Bypass Valves to initiate RPV depressurization:

> *If the RPV is depressurized to less than 700 psig without the reactor feed pump discharge valves closed and the condensate system is in service, then an uncontrolled flood of the RPV will take place as condensate water injects through the feed pumps into the RPV.* ***Normally, Condensate system injection is controlled by placing Feedwater in startup level control.*** [emphasis added]

Step RC/P–1 maintains the availability of Condensate as the primary means of reactor vessel inventory makeup during the RPV depressurization. Tripping the condensate pumps would **not** be appropriate to prevent uncontrolled injection.

The requirement for preventing uncontrolled condensate injection prior to Rapid Depressurization is specified in EO–100–112 Step RD–3.

PREVENT UNCONTROLLED COND INJECTION
EXCEPT AS REQ'D TO ASSURE
ADEQUATE CORE COOLING

The bases for this step do not describe a preferred method for accomplishing the necessary condensate lineup

This step is applicable as long as it does not conflict with restoring or assuring adequate core cooling.

If the RPV is depressurized to less than 700 psig without preventing uncontrolled condensate injection then an uncontrolled flood of the RPV will take place as condensate water injects through the feed pumps into the reactor.

Once Rapid Depressurization is required, prompt action is required to establish the conditions necessary. Tripping the condensate pumps **would** be appropriate if necessary to prevent uncontrolled injection.

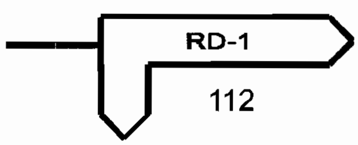
Conditions must be evaluated to determine whether the time available before Suppression Pool level reaches 38 feet, when Rapid Depressurization becomes required by EO–100–103, allow for realigning the condensate system for startup level control and fully opening the Turbine Bypass Valves. The question specifies that Suppression Pool level rose 0.5 feet in the time between inserting a reactor scram per ON–100–101 and entering EO–100–102. Performance of immediate operator actions post–scram, providing an initial scram report, and Unit Supervisor evaluation of plant conditions and decision to enter EO–100–102 can be assumed to occur in a brief interval, as soon as one minute. Given this 0.5 foot/minute rate of Suppression Pool rise, the 38 foot limit where Rapid Depressurization is required will be reached in approximately 5 minutes.

At SSES the feedwater Integrated Control System is designed to automatically align condensate and feedwater systems for startup level control. Uncontrolled condensate injection is prevented by full closure of the reactor feedpump isolation valves HV-10603A(B)(C). The SSES simulator was used to determine that the nominal time from reactor scram until all three HV–10603 valves are closed is approximately 4.5 minutes. The next appropriate action to mitigate the event is to initiate a RPV depressurization by fully opening the Turbine Bypass Valves.

RPV depressurization is not assurance of mitigation of the rising Suppression Level trend and maintaining Suppression Pool level below 38 feet, as the nature of the inleakage is unspecified. As previously noted, given the severe inleakage into the Suppression Pool, that the inleakage continues, and that efforts undertaken to reduce Suppression Pool level have failed, it is apparent that the limit will ultimately be exceeded. It is reasonable for the applicant to assume that the question requires a determination of the ultimate mitigating action that will be required by EO–100–103 for the transient, based on the wording of the question

*In accordance with EO–100–103, "PC Control", which one of the following steps **would be** correct and why?*

Performing Rapid Depressurization will be required per EO–100–103 Step SP/L–14 when Suppression Pool level reaches 38 feet. The instruction in EO–100–103 Step SP/L–14 for Rapid Depressurization requires entry into EO–100–112 via the concurrent exit and continue arrow on EO–100–103 Step SP/L–14.



Regardless of the state of the Turbine Bypass Valves, all Automatic Depressurization System valves will have to be opened per E0–100–112 Step RD–8 when Suppression Pool level reaches 38 feet. This makes choice D a second correct answer to the question.

D. Rapid depressurization prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

It is the recommendation of SSES to accept D as a second correct answer to this question. Choice C remains a correct answer as justified in the original submittal. Choices A and B remain incorrect as explained in the original submittal.

References:

EO–000–103, Primary Containment Control

EO–000–102, RPV Control

OP–AD–055, Operations Procedure Program

NRC Resolution for RO Question #86:

The NRC conducted detailed reviews of all the references provided and concluded that the NRC agrees with the licensee's recommendation to accept both answers "C" and "D" as correct answers.

The original correct answer for this question is C and was justified with procedure EO–000–103 step SP/L–14 bases, which states that: If rapid depressurization is anticipated and the reactor is shutdown on control rods, Main Turbine Bypass Valves **may** be used to depressurize the RPV until the rapid depressurization limit, "38 feet," is reached. The bases does not use **should** as stated in the answer justification. In addition, the NRC reviewed the bases for the EO-000-102 step RC/P-3 which states that:

> *If it is anticipated that rapid depressurization may soon be required, it is appropriate to discharge as much energy as possible as quickly as possible from the RPV to a heat sink other than the suppression pool. Such action will preserve, for as long as possible, the heat capacity of the suppression pool should rapid depressurization actually become required. For this reason the main turbine bypass valves are the **preferred** method of depressurization.* [emphasis added]

NRC noted that EO-100-102 indicates that main turbine bypass valves are the **preferred** method to support the anticipated depressurization. Based on **slow** suppression pool level rising trend specified in the question stem, NRC determined that it is reasonable to assume that the high limit of 38 feet will ultimately be exceeded, however, the amount of margin left for the Suppression Pool level to reach the high limit of 38 feet plays an important role in determining the correct operator action. NRC noted that the bases for step RC/P–3 in EO–000–102 provides the following guidance for use of Turbine Bypass Valves in anticipation of Rapid Depressurization:

> *"Anticipated" implies an expectation that an emergency RPV depressurization requirement cannot be averted by actions prescribed in the EOPs and <u>will soon be reached</u>. The expectation must be based on:*

1. *An evaluation of plant conditions which includes an extrapolation of parameter trends…*

   *… The words "cannot be maintained" neither require nor prohibit anticipatory action. Depending upon plant conditions, rapid depressurization **may be performed as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached…***[emphasis added]

The NRC determined that based on margin left for the suppression pool level to reach the high limit of 38 feet, it is reasonable to assume that there is adequate time available to open ALL BPVs to depressurize the reactor pressure vessel (RPV) prior to rapid depressurization. The NRC bases for this assumption is that it takes approximately one minute to perform the immediate scram actions and in that one minute in time if the suppression pool level increases 0.5 foot (35 feet to 35.5 feet) with that rate in mind, it would take approximately five minutes for suppression pool level to increase 2.5 feet and reach the 38 foot limit at which time Rapid Depressurization would be required. The NRC concluded that operators would have more than adequate time (i.e., approximately 5 minutes) to open ALL BPVs in order to depressurize the RPV prior to reaching the rapid depressurization limit.

NRC noted that the requirement for preventing uncontrolled condensate injection prior to rapid depressurization is specified in the bases EO–000–102 Step RC/P–1, which is intended to prevent uncontrolled RPV flooding when pressure drops below the condensate pump shut-off head of 700 psig. If the RPV is depressurized to less than 700 psig without the reactor feed pump discharge valves closed and the condensate system is in service, then an uncontrolled flood of the RPV will take place as condensate water injects through the feed pumps into the RPV.

NRC noted that the bases EO–000–102 Step RC/P–1 provides guidance on **normal** method of placing feed water in startup level control to prevent uncontrolled condensate injection. At SSES the feed water Integrated Control System (ICS) is designed to automatically align condensate and feed water systems for startup level control. Uncontrolled condensate injection is prevented by full closure of the reactor feed pump isolation valves HV-10603A(B)(C), however, the nominal time from reactor scram until all three HV–10603 valves are closed is approximately 4.5 minutes. NRC determined that since that the requirements specified in the Rapid Depressurization bases EO-000-112 does not provide any guidance on normal or preferred method to prevent uncontrolled condensate injection due to urgency of the condition and prompt action requirement based on Rapid Depressurization, it is reasonable to conclude, based on the stem conditions and the trend of suppression pool level rise, that applicants would determine that it is appropriate to discharge as much energy as possible as quickly as possible from the RPV to the condenser rather than the suppression pool, therefore, prompt actions are required rather than waiting for ICS automatic actions to occur. NRC determined that once the decision is made that Rapid Depressurization is anticipated or required, it is not appropriate to postpone opening all BPVs or performing Rapid Depressurization to wait for feed water and condensate to realign for startup level control.

NRC determined that prompt action of tripping the condensate pumps would be appropriate to prevent uncontrolled condensation injection conditions prior to depressurizing < 700 pisg if ICS has not yet transitioned to startup level control. NRC determined that all of the BPVs can be promptly opened using BPVs jack. SSES simulator data determined that within the approximate 5 minute margin left for the Suppression Pool level to reach the high limit of 38 feet, significant energy is discharged to the heat sink. This action is consistent with the basis of anticipation of rapid depressurization, to discharge as much energy as possible as quickly as possible from the RPV to a heat sink other than the suppression pool using the preferred method of the main turbine bypass valves.

For the reasons stated above, the NRC determined that "C" would procedurally be the preferred method to depressurize the RPV given the plant conditions presented in this question.

However, the NRC has concluded that "D" is also a technically correct answer to the question, "In accordance with EO–100–103, "PC Control", which one of the following steps would be correct and why?" NRC again noted that the bases for step RC/P–3 in EO–000–102 provides the following guidance in anticipation of Rapid Depressurization:

> *"Anticipated" implies an expectation that an emergency RPV depressurization requirement cannot be averted by actions prescribed in the EOPs and <u>will soon be reached</u>. The expectation must be based on:*
>
> 1. *An evaluation of plant conditions which includes an extrapolation of parameter trends…*
>
>   *… The words "cannot be maintained" neither require nor prohibit anticipatory action. Depending upon plant conditions, rapid depressurization* ***may be performed as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached…***[emphasis added]

One of the conditions in the question stem stated at a suppression pool level of 35 feet a reactor scram was performed, based on the 3 foot margin to the suppression pool high-level Rapid Depressurization limit. Following the scram an additional influx of 20,000 gallons has occurred based on the additional 0.5 foot rise in pool level, and pool level continues to rise. Given the severe in-leakage into the Suppression Pool, that the in-leakage continues, and that efforts undertaken to reduce Suppression Pool level have failed, it is apparent that the limit will ultimately be exceeded. As stated above, the words *"cannot be maintained" neither require nor prohibit anticipatory action.* It would not be technically incorrect for an SRO given these circumstances to make the declaration that Suppression Pool level cannot be maintained less than 38 feet, Rapid Depressurization is required per EO–100–103 step SP/L–14.

EO–100–103 step SP/L–14 states:

WHEN *SUPP POOL LVL CANNOT BE MAINTAINED <* ***38'***

1 RAPID DEPRESS IS REQ'D
2 CONTACT TSC TO ENTER EP DS 002 RPV AND PC FLOODING

For the reasons stated above, the NRC concludes that the designated key answer "C" is procedurally the preferred answer. However, answer choice "D" is technically correct and will also be accepted as a correct answer.

In summary, the NRC has concluded that both "C" and "D" are correct answers to this question and choices "A" and "B" remain incorrect.

REFERENCES FOR POST EXAM COMMENTS

Q 69
REF

PROCEDURE COVER SHEET

PPL SUSQUEHANNA, LLC PROCEDURE	
STATION COMPONENT VERIFICATION REQUIREMENTS ADHERENCE LEVEL: INFORMATION USE	5/11/2011 NDAP-QA-0027 Revision 11 Page 1 of 37 Q referenced Rev 10

QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE:	
PERIODIC REVIEW FREQUENCY:	N/A
PERIODIC REVIEW DUE DATE:	N/A

RECOMMENDED REVIEWS:
PORC

Procedure Owner:	Asst. Ops Manager-Work Control
Responsible Supervisor:	Asst. Ops Manager-Work Control
Responsible FUM:	Manager-Nuclear Operations
Responsible Approver:	Plant Manager

1. PURPOSE/SCOPE

Establish verification requirements for component status at SSES and provide guidance for selecting the appropriate verification technique to use.

NDAP-QA-0027 establishes techniques used to perform component verifications. Station programs and procedures implement the verification requirements contained herein. For example: verification requirements applicable to restoration from a Clearance Order are built into the Energy Control Process; verification requirements applicable to Temporary Modifications are built into the Temporary Modification program; verification requirements applicable to work activities are built into their governing procedures; verification requirements applicable to system pre-operational alignments are built into system check-off lists (CL's); etc.

2. POLICY/DISCUSSION

It is essential for personnel and reactor safety that the status of plant equipment be effectively controlled. It is also recognized that any individual, no matter how proficient and conscientious, can make an error. Where the risks and consequences of such an error are significant, formal verification techniques are used to reduce the probability of such an error going undetected. As such, verification is an important part of our "defense in depth" concept.

The independent verification (IV) process confirms the condition of equipment required to be in a particular condition to maintain the plant's physical configuration required for safe operation. Otherwise, an adverse consequence could result later if the improper condition remained undetected. Independent verification can only be used when an immediate, adverse consequence of a mistake by the performer cannot occur, because IV catches the performer's errors after they have been made, not before.

The IV process ~~tends to have a~~ higher probability of catching an error than Peer Check or Concurrent Verification, since the verifier's knowledge of the system, component, or work situation remains untainted by the performer. The individual performing the verification physically checks the component's condition without relying on observation of or verbal confirmation by the performer. The verifier cannot be directly involved in an activity while it is being performed. It is, however, acceptable for an individual involved with a test or evolution to perform an IV for an activity within the test or evolution as long as that individual is not present while the activity is performed.

(6) Activities associated with Control Room switches, controllers, etc. when the device is labeled by component noun name or description only.

b. If the component identification number in the guiding document and plant label do not match, the activity shall be stopped and the guiding document corrected.

NOTE:	The following step is not applicable in those situations where the noun name has been omitted from the installed plant label.

7.1.2 When operating or verifying the condition of plant equipment, the component noun name should provide an accurate description of the component.

a. If the noun name in the guiding document is not an accurate description of the component:

(1) STOP and notify supervision.

(2) Initiate an AR.

(3) Have the guiding document or plant label corrected before proceeding.

7.2 Independent Verification

7.2.1 The following steps shall be performed for each Independently Verified activity. Refer to Attachment C for additional details.

a. The performer performs the following actions:

(1) Self-check the correct component.

(2) Perform the action specified in the guiding document.

(3) Confirm the expected results.

(4) Check place keeping box, sign or initial the guiding document.

(5) Inform the supervisor upon completion of the task or notify the assigned verifier.

b. When notified, the verifier performs the following actions:

(1) Self-check the correct component.

(2) Determine the As-Found condition, without changing it, using one or more of the following means:

(a) physical hands-on check (preferred)

(b) remote indication:

1) If multiple remote indicators are available, use as many as possible.

2) If possible, perform at least one check locally to confirm remote indication.

(c) System response

(3) Compare the As-Found condition with the guiding document.

(4) Notify supervision if the component's condition does not agree with the guiding document.

(5) Sign or initial the guiding document if the component's condition agrees with the guiding document.

(6) Notify the supervisor or performer upon completion of the IV.

7.3 Concurrent Verification

7.3.1 The following steps shall be performed for each concurrently verified activity. Refer to Attachment D for additional details.

a. Referencing the guiding document separately, the performer and verifier mutually agree on the action to take and the equipment condition to achieve prior to execution.

b. The performer self-checks the correct component.

c. The verifier separately self-checks the correct component.

INDEPENDENT VERIFICATION PROCESS

1.0 The intent to perform an action required by a guiding document exists. The procedure, maintenance work package, clearance order, other document used to guide the work, or the immediate supervisor requires the use of IV for the particular step or series of steps.

1.1 Using the guiding document, the performer identifies the component and performs the action on that component.

If the performer is conducting an initial verification task, he determines the as-found status of the component using methods specified by management for the type, make, or model of the component.

1.2 The performer checks the place keeping box, signs or initials the guiding document to signify that the component is in the condition required by the guiding document. Usually, this is the first of two signatures or initials.

1.3 In this case the performer completes all verifications and/or actions according to the guiding document and reports to a supervisor overseeing the activity.

1.4 In this case the performer completes all verifications and/or actions according to the guiding document and, instead of notifying a supervisor, notifies the verifier directly.

CAUTION

The performer and verifier must maintain *Freedom Of Thought* throughout the IV process. the performer does not want to bias the verifier by talking about anything he/she has done or conditions related to the initial activity.

1.5 Using the guiding document, the verifier self-checks the correct component, without performing any manipulation of the component.

The verifier determines the as-found status of the component using methods specified by management for the type, make, or model of the component.

1.6 The verifier compares the component's as-found status with that required by the guiding document.

If the as-found condition is incorrect, perform step 1.7.

If the as-found condition is correct, perform step 1.8.

1.7 If the condition is incorrect, notify the overseeing supervisor. Again, the verifier does not change the status of any component or equipment. Initiate an AR to document near miss.

INDEPENDENT VERIFICATION PROCESS

1.8 If the component's as-found condition is correct according to the guiding document, the verifier signs or initials the guiding document in the appropriate space and proceeds to the next component, if independently verifying more than one component.

1.9 Upon completion of the independent verification, the verifier informs the supervisor.

1.10 Upon completion of the independent verification, the verifier informs the performer.

2.0 At Risk Practices to Avoid

2.1 Independent Verifier is in close proximity at the time the performer acts.

2.2 Performer and Independent Verifier walk to the component location together before the initial act.

2.3 Performer informs the Independent Verifier of what has or has not been done before the IV.

2.4 Performer is less attentive to the action, believing the Independent Verifier will catch any problems.

2.5 Performer leaving clues such as open panel doors, highlighted drawings, flagging, etc. which may bias the independent verifier.

PROCEDURE COVER SHEET

Q 69

PPL SUSQUEHANNA, LLC PROCEDURE	
ENERGY CONTROL PROCESS ADHERENCE LEVEL: BY SECTION	12/07/2011 NDAP-QA-0322 Revision 37 Page 1 of 86 Q repeated Rev 35

QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE: ______________

PERIODIC REVIEW FREQUENCY: ______________

PERIODIC REVIEW DUE DATE: ______________

page 24 & 55 Attachment D & E Attachment I to remove

RECOMMENDED REVIEWS:

Recommended:
Operations, Maintenance, Work Management, Safety, Training, Health Physics, Site Nuclear Assurance
Required:
ECP Oversight Committee (for training impact [3] and strategic direction), PORC

Procedure Owner: ECP Oversight Committee

Responsible Supervisor: ECP Oversight Committee Chairman

Responsible FUM: Manager-Nuclear Operations

Responsible Approver: Plant Manager

4.6.3 Provide authorization for trained personnel to perform specific aspects of this process, including switching and accepting Clearance Orders. [Ref: PLI-0086058 Delegation of Permit Responsibility]

4.7 Holder

4.7.1 Verifies Clearance Order Accuracy.

4.7.2 Verifies Clearance Order Adequacy.

4.7.3 Verifies Clearance Order Effectiveness.

4.7.4 Conducts crew briefs with Authorized Workers.

4.7.5 Informs Authorized Workers before changing Clearance Order status.

4.7.6 Applies Additional Elements.

4.7.7 Signs-on appropriate Clearance Order as an Authorized Worker before breaking the plane of a Clearance Order boundary.

4.8 Independent Reviewer

4.8.1 Independently reviews a Clearance Order in accordance with this procedure.

4.8.2 Shares equal responsibility with Preparer.

4.8.3 Maintains a Senior Reactor Operator License or is a designee.

4.9 Plant Manager

4.9.1 Ensures required procedures are developed and maintained.

4.9.2 Ensures Energy Control equipment provided.

4.9.3 Ensures audits and inspections are performed.

4.9.4 Ensures training is developed and implemented.

4.10 Preparer

4.10.1 Prepares Clearance Orders in accordance with this procedure

4.10.2 Maintains a Reactor Operator License or is a designee

4.11 Shift Manager

4.11.1 Grants permission to remove an Unavailable Authorized Worker from a Clearance Order.

4.11.2 Grants permission for work to resume following an ECP event.

4.11.3 Grants permission for use of "Per Telecon Signature."

4.12 Shift Supervision

4.12.1 Ensures plant conditions are acceptable for application and restoration of Clearance Orders

4.12.2 Authorizes application and restoration of Clearance Orders.

4.12.3 Performs Clearance Order foreign potential reviews.

4.13 Station Engineering

4.13.1 Perform Technical Evaluations as required to support Energy Control Process.

4.14 Switchman

4.14.1 Manipulates equipment and components as required.

4.14.2 Verifies Clearance Order Accuracy.

4.14.3 Verifies Clearance Order Effectiveness.

4.15 System Clearance Holder (SCH)

4.15.1 Administers Clearance Orders for designated maintenance work activities during Outages.

4.15.2 Assumes all duties as a Holder.

4.16 System Operating Representative SOR

4.16.1 Administers the Energy Control Process by acting as the focal point for Clearance Orders.

4.17 Work Document Planner

4.17.1 Provide Work Order scope description and list of equipment requiring isolation to Clearance Order office.

4.17.2 Provide list of suggested Energy Isolating Devices.

4.17.3 Identifies type of energy control required for each work document.

5. DEFINITIONS

5.1 ADDITIONAL ELEMENT (AE)

An additional safety measure used to reduce the likelihood of inadvertent release of energy. [Ref: 29 CFR 1910.269(d)(2)(ii)(B)(2)]

5.2 ADMIN RED TAG

A methodology that uses tag sharing to turn a Clearance Order into a virtual component.

5.3 ADMIN TAGOUT

A Clearance Order that provides the boundary of protection for an Admin Red Tag.

5.4 AFFECTED WORKER (All Station Personnel)

A person in the vicinity of equipment with a Clearance Order applied.

5.5 ALARA BLOCKING

Blocking required to isolate or minimize transient high radiation conditions from a specific room or area for personnel protection.

5.6 ATYPICAL CLEARANCE ORDER

A Clearance Order deviating from normal Clearance Order standards.

b. The limits of protection provided.

6.10 SHIFTLY CO FUNCTIONS (INFORMATION USE)

6.10.1 Each shift the following actions shall be performed:

a. Holders that have accepted a Clearance Order shall **Verify** the status of the Clearance Order and shall **Utilize** Attachment M to **Conduct** an ECP Crew Briefing prior to the start of each shift.

b. Prior to starting work each shift, Authorized workers shall **Signify** receipt of the briefing by signing on the Clearance Order for each job.

c. Authorized Workers shall **Sign Off** the Clearance Order at the end of each shift.

d. The Holder shall maintain a record of Clearance Order status to be used as a means to provide a turnover to upcoming shift personnel.

6.11 RELEASE CLEARANCE ORDER (INFORMATION USE)

6.11.1 Holder shall **Utilize** Attachment H, Clearance Order Release, to release a Clearance Order.

6.12 REMOVING CLEARANCE ORDER (INFORMATION USE)

6.12.1 Operations Supervision concurs with Clearance Order removal **AFTER** all Holders have released the Clearance Order and all work requiring Clearance Order is complete.

6.12.2 SOR shall **Complete** restoration plan for components and switching moves on Clearance Order.

a. **Ensure** any Motor Operated Valves used for blocking are stroked in accordance with OP-000-002 prior to returning the system to service.

b. **Ensure** restoration of Clearance Order prevents introduction of system or plant transients.

c. Restoration of Clearance Order should consider requirements for post-maintenance testing or Operability testing.

d. Upon completion of restoration plan, the system should be restored to the design operating condition (e.g. running automatic standby, etc.).

6.12.3 Operations Supervision shall **Utilize** Attachment D, Clearance Order Authorization Checklist to **Review** and **Approve** Clearance Order restoration plan.

6.12.4 SOR shall **Utilize** Attachment E to brief Switchman **AND** Concurrent Verifier on removing Clearance Order and procedure for restoration of equipment.

6.12.5 Switchman and Concurrent Verifier shall **Utilize** Attachment I, to remove Clearance Order and restore equipment.

6.12.6 If applicable, SOR **Briefs** Independent Verifier on Clearance Order verification requirements.

a. Independent Verifier **Confirms** removal of Clearance Order.

6.13 CLOSE OUT, ARCHIVE CO (INFORMATION USE)

6.13.1 After Clearance Order has been removed and verified as required, SOR shall **Close Out** Clearance Order and advance to Archive status.

CLEARANCE ORDER AUTHORIZATION CHECKLIST (INFORMATION USE)

Clearance Order Application Authorization

- ☐ Clearance Order in Hold status, independent review complete.
- ☐ Job flow understood
- ☐ Plant conditions acceptable
- ☐ Redundant train operability assessed
- ☐ Required pre-clearance testing performed
- ☐ Applicable procedure prerequisite actions satisfied
- ☐ Tech Spec & Admin requirements met/initiated
- ☐ Clearance Order application authorized
- ☐ Clearance Order application pre job brief initiated

Clearance Order Removal Authorization

- ☐ System and component restoration direction acceptable
- ☐ Component restoration verification levels correct
- ☐ Restoration sequence acceptable
- ☐ Clearance Order restoration coordinated with other post clearance activities such as post maintenance tests, Operability testing, etc.
- ☐ Ensure any Motor Operated Valves used for blocking are stroked in accordance with OP-000-002 prior to returning the system to service.
- ☐ Ensure Clearance Order Restoration will not introduce a system or plant transient.
- ☐ Upon completion of restoration plan, the system should be restored to the design operating condition (e.g. running, automatic standby, etc.).
- ☐ Clearance Order tag removal authorized
- ☐ Clearance Order restoration pre job brief initiated

Comments:

Used to Brief Switchman and Concurrent Verifier

SWITCHMEN CLEARANCE ORDER BRIEFING (INFORMATION USE)

<u>SOR Preparation for briefing:</u>

- ☐ Review Clearance Order instructions, notes, hazards, and tag notes.
- ☐ Verify system is aligned correctly to support Clearance Order application (i.e. system shutdown, MOV's closed, etc.)
- ☐ Obtain and review procedures, RLWO impacts and effects, scope of work, and other information.
- ☐ Verify Clearance Order paperwork is correct (proper signatures, instructions, tag notes are current and correct)
- ☐ Review tag sequence and equipment descriptions.
- ☐ Understand as-left status of equipment/system (i.e. vented, drained, de-energized, running, standby, etc.).
- ☐ For draining, verify liquid can be sent to LRW or if barrels are required.
- ☐ Review extra information needed to drain/depressurize the system.
- ☐ Review procedures/instructions to fill system, verify all components will be filled, i.e. pump casing, heat exchanger, and instrument piping.
- ☐ Provide any information about any impairment tied to the Clearance Order.

Apply	Restore	T-Lift	Brief given to Operators Hanging/Restoring/T-Lifting Clearance Order
☐	☐	☐	• Give the big picture of what is being tagged out/restored. Provide general description of Maintenance work scope.
☐	☐	☐	• Review Clearance Order instructions, equipment which will be removed/returned from/to service, relevant RLWO impacts and effects, as-left system status, method to verify CO Effectiveness.
☐	☐	☐	• What is expected to happen, if not right, what to do.
☐	☐	☐	• Discuss any communications or coordination required with Control Room, alarms, breaker opening notification, etc.
☐	☐	☐	• Contact person from other Craft needed during Clearance Order application/removal. Provide name and phone number. Example: Maintenance for gagging valves, I&C for instrument isolation, etc.
☐	☐	☐	• Discuss error likely situations.
☐	☐	☐	• Discuss place keeping.
☐	☐	☐	• Reverse brief.

Comments:

REMOVE CLEARANCE ORDER (INFORMATION USE)

- ☐ 1. Pre job briefing by SOR to Switchman and Concurrent Verifier performing Clearance Order restoration, procedure to restore equipment, and as-left system/equipment status complete.
- ☐ 2. **Ensure** Clearance Order authorized for removal by verifying CO Restore step signed off.
- ☐ 3. **Identify** correct EIDs. Reference NDAP-QA-0027, Station Component Verification Requirements.
- ☐ 4. **Remove** tag.
- ☐ 5. **Remove** AE if applied.
- ☐ 6. **Place** EID in correct position as listed on the Clearance Order.
- ☐ 7. Document tags removed in eSOMS.
- ☐ 8. The Concurrent Verifier verifies items above for all EIDs and documents concurrent verification for EIDs not requiring independent verification.
- ☐ 9. Another Switchman independently verifies component restoration as required per NDAP-QA-0027 and documents in eSOMS.

Comments:

Q 79

PROCEDURE COVER SHEET

<table>
<tr><td>PPL SUSQUEHANNA, LLC PROCEDURE</td><td></td></tr>
<tr><td>LEVEL/POWER CONTROL

ADHERENCE LEVEL: STEP-BY-STEP CONDITIONAL</td><td>11/01/2010
EO-000-113
Revision 9
Page 1 of 67</td></tr>
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QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE: ______

PERIODIC REVIEW FREQUENCY: 2 Year

PERIODIC REVIEW DUE DATE: ______

RECOMMENDED REVIEWS:

Procedure Owner: EOP Coordinator

Responsible Supervisor: Supervisor-Operations Engineering

Responsible FUM: Manager-Nuclear Operations

Responsible Approver: Manager-Nuclear Operations

1. GENERAL

Provides instructions to control reactor power, RPV water level, and RPV pressure during ATWS events. These three parameters are controlled in a manner which minimize the threat to both core and primary containment integrity. Core integrity is threatened by operation with low RPV water level (near or below TAF), low RPV pressure, and high core inlet subcooling. Primary containment integrity is threatened by excessive thermal loading.

Operation with water level near or below TAF is avoided because in this region level is expected to be difficult to control, there is potential for fuel uncovery and heat-up of the cladding, and only Fuel Zone level indication, which is not calibrated for reactor operation at rated pressure, is available.

At low RPV pressure the reactor is expected to be highly unstable, and power oscillations may lead to fuel damage. Unstable operation with potential for fuel damage can also occur at high levels of core-inlet subcooling even with the reactor at rated pressure.

In the non-isolation ATWS (MSIVs open), containment integrity is threatened by fission power in excess of the turbine bypass system capacity. For the isolation ATWS, fission power in excess of the RHR system capacity presents a threat to containment.

Actions which are designed to limit threat to core and containment include:

- Optional methods of inserting control rods and injection of boron.
- Reducing reactor power and core-inlet subcooling by deliberately lowering RPV water level.
- Assigning a priority to the use of injection systems.
- Delaying RPV cooldown until reactor shutdown has been assured by control rod insertion or injection of Cold Shutdown Boron Weight.
- Avoiding reactor depressurization on PSL and HCTL if initial ATWS power was greater than 5%.
- Raising RPV water level to remix boron.

Generic tracking tables for ES procedures and parameters are on the board to assist the operating crew in tracking parameter trends and ES procedure implementation. These were added to the board as aids, and do not trigger or direct activities.

Initial ATWS power does not change on re-entry to this procedure.

(Reference: PSTG first override before RC/P-2, SP/T-3, PC/P-3)

LQ-7 MONITOR AND CONTROL LQ/Q LQ/L AND LQ/P CONCURRENTLY

The symptomatic approach to emergency response, upon which the EOPs are based, precludes being able to establish in advance a priority for executing any of the parallel action paths of Level/Power control. Rather, current values and trends of parameters and the status of plant systems and equipment dictate the relative importance of individual Level/Power Control steps and the relative priority with which they should be accomplished.

(Reference: PSTG RC-1 Monitor and Control Concurrently)

LQ/Q - Reactor Power Control

LQ/Q-1 IS INITIAL ATWS PWR **> 5%**
OR CANNOT BE DETERMINED

An affirmative answer to this question results in immediate boron injection.

When scram and ARI have failed, initial ATWS power must be assessed to determine if immediate boron injection is required. If initial ATWS power was greater than 5%, then a relatively large number of control rods have failed to insert. The seriousness of this condition requires immediate injection of boron to positively terminate the ATWS event.

If power is oscillating around 5%, it is conservative to declare power is > 5%.

Early boron injection has the following benefits:

- Stop or prevent large-magnitude Limit Cycle Oscillations which can lead to core damage.
- Limit fuel damage from uneven flux patterns that could result from partial rod inserts.
- Protect the primary containment from excessive heat input.

(Reference: PSTG step RC/Q-2)

LQ/Q-2 **BEFORE** SUPP POOL TEMP REACHES **150°F**

GO TO LQ/Q-3

The intent of this step is to ensure, for a low power ATWS, that boron is injected early enough to minimize the challenge to primary containment integrity.

If boron injection was not required due to initial power level and conditions have since changed, this step ensures boron initiation takes place early enough to minimize the challenge to primary containment integrity. If boron injection is initiated before suppression pool temperature reaches 150°F, emergency RPV depressurization due to HCTL may be precluded for initial ATWS power levels ≤ 5% for an isolated RPV with suppression pool cooling in service. At higher power levels, the HCTL will be exceeded.

This step will only be required if initial ATWS power was ≤ 5%. If initial ATWS power was > 5%, boron injection would have been required per steps LQ/Q-3 or LQ/Q-4.

The logic term "BEFORE" permits injection of boron at any temperature up to the suppression pool temperature of 150°F. If suppression pool temperature exceeds 150°F, the action of this step is still required.

Level/Power Control is entered from RPV Control if more than one control rod is > 00. If, however, a scram condition exists, reactor power is ≤ 5%, and no other RPV control entry condition exists, there is no permission to enter Level/Power Control from the EOPs. To authorize use of alternate methods of control rod insertion in this situation, entry to Level/Power Control at this step is directed from ON-100-101 (ON-200-101) Scram, Scram Imminent. However, if any entry condition occurs while inserting control rods, EO-000-113 must be entered at LQ-1.

(Reference: PSTG step RC/Q-6)

LQ/Q-3 INJECT SBLC
AND
INHIBIT ADS, IF NOT INITIATED

ADS initiation may result in the injection of large amounts of relatively cold, unborated water from low pressure injection systems. With the reactor either critical or shutdown on boron, the positive reactivity addition due to boron dilution and temperature reduction through the injection of cold water may result in a reactor power excursion large enough to cause substantial core damage. Preventing ADS is therefore appropriate whenever boron injection is required.

However, if ADS has already initiated prior to performing this step, it is not inhibited. Actions to limit injection flow rates to maintain RPV level or flooded conditions will already be in progress, and the loss of boron will be minimized. Additionally, inhibiting ADS if already initiated will conflict with direction provided by other Emergency Procedures.

Instructions for inhibiting ADS are located in OP-183-001 (OP-283-001), Automatic Depressurization System & Safety/Relief Valves.

(Reference: PSTG step RC/Q-2 and second override before RC/Q-1)

This override terminates only injection "from sources external to the primary containment." Injection from the suppression pool may continue. Injection from boron injection systems and CRD is <u>not</u> terminated because operation of these systems may be needed to establish and maintain the reactor shutdown.

(Reference: PSTG override before C5-1)

LQ/L-10 **IF** RAPID DEPRESS REQ'D

GO TO LQ/L-18

This step is applicable to all subsequent steps within this flowpath. It remains applicable to those steps until flowchart is exited.

The steps which follow specify the use of various systems to control RPV water level. If rapid depressurization of the RPV is required, these systems must be operated to minimize the potential for rapid injection of cold, unborated water into the core region as RPV pressure decreases below pump shutoff head. Steps following LQ/L-18 provide appropriate instructions for controlling injection systems in this manner.

(Reference: PSTG 1st override before C5-5)

LQ/L-11 IS INITIAL ATWS PWR **> 5%** OR CANNOT BE DETERMINED

Answer to this question determines which water level control band will be prescribed.

(Reference: PSTG step C5-5)

<u>CAUTION</u>

A RAPID INCREASE IN INJECTION
MAY INDUCE LARGE PWR EXCURSION
AND SUBSTANTIAL CORE DAMAGE.

This caution is applicable throughout this flowpath.

This Caution highlights the potential for large reactor power excursions and subsequent core damage from rapid injection of cold, unborated water when injection is continued, per the next step, to maintain RPV water level within the prescribed band.

(Reference: PSTG Caution 6)

Since a prompt reduction in RPV pressure is desired as soon as possible to discontinue SRV cycling, adherence to a specific SRV opening sequence is unwarranted in this step.

(Reference: PSTG step RC/P-1)

LQ/P-4 **IF** INITIAL ATWS PWR ≤ **5%**
AND
SUPP POOL TEMP AND LVL CANNOT BE MAINTAINED BELOW FIG **2** HCTL

MAINTAIN RPV PRESS BELOW LIMIT EXCEEDING COOLDOWN RATE IF NECESSARY

This step is applicable to all subsequent steps within this flowpath. It remains applicable to those steps until flowchart is exited.

If suppression pool temperature and level cannot be maintained below HCTL (Heat Capacity Temperature Limit) the primary containment vent valve opening pressure may be exceeded following RPV depressurization. Refer to step SP/T-4 in EO-000-103 for discussion of HCTL.

The figure is not provided on this flowchart because the condition requires that containment parameters be controlled first. The containment control procedure will provide the required figure and is performed concurrently with this procedure. Therefore, the action of this step is only applicable when the figure is already being referenced.

Fuel damaging, large amplitude power excursions may occur at low RPV pressures if reactor power is > 5%. Also, development of the HCTL assumes that the reactor is shutdown. Therefore, depressurization due to HCTL or PSL during an ATWS is restricted to conditions where initial ATWS power level is ≤ 5%. The 5% determination is based on "initial ATWS power," or reactor power before water level is lowered or boron is injected because there is no guarantee level will remain low or boron will remain in the core following depressurization. Therefore, if initial ATWS power level is > 5%, depressurization is not required for this step.

Control of suppression pool temperature is directed in the SP/T flowpath of EO-000-103. If the actions currently being taken in EO-000-103 to limit suppression pool temperature increase are inadequate and initial ATWS power is ≤ 5%, RPV pressure is reduced in order to remain below the HCTL.

If SRVs are used to maintain RPV pressure below the HCTL, the margin to the limit will not improve; that is, the delta between containment parameters and the HCTL will not increase. This is because SRV use adds heat to the suppression pool, and suppression pool temperature is one of the three factors that is included in the HCTL. Other methods of RPV depressurization that discharge outside primary containment, such as BPV's, and HPCI in CST to CST mode, reduce RPV pressure without adding heat to the suppression pool, thereby, increasing margin to the limit.

The normal cooldown rate LCO may be exceeded to the extent necessary to maintain RPV pressure below the HCTL. If RPV pressure cannot be maintained below the HCTL, emergency RPV depressurization will be required, possibly resulting in an even more rapid cooldown.

(Reference: PSTG 1st override before step RC/P-2)

LQ/P-5 **IF** ALL:

- BORON INJECTION REQ'D
- MAIN CONDENSER AVAILABLE
- NO GROSS FUEL FAILURE
- NO MSL BREAK

BYPASS MSIV AND CIG INTERLOCKS
AND
OPEN MSIV'S IAW ES-184-002 (ES-284-002)

This step is applicable to all subsequent steps within this flowpath. It remains applicable to those steps until flowchart is exited.

To stabilize and control RPV pressure, the reactor steam generation rate must remain within the capacity of systems designed to remove the steam from the RPV. With the reactor not subcritical, the amount of steam that may have to be released could be substantial. If this heat energy is discharged to the suppression pool, the HCTL could be reached in a very short time. Therefore, utilization of the main condenser as a heat sink for this energy is of sufficient importance to warrant opening the MSIVs even if the valves automatically closed.

- No indication of steam line break, since opening MSIVs with a break in the downstream piping could result in an uncontrolled loss of reactor coolant inventory, release of fission products to the environment and cause personal injury or significant damage to plant equipment. It is difficult, however, to determine whether a steam line break exists with the MSIVs closed, other than by visual inspection of system piping. If there is reasonable assurance that no break existed before MSIV closure, an operator may conclude that no break developed subsequent to valve closure. Still, the judgment is subjective, based on assessment of all available indications. If it is concluded that no steam line break exists but, in actuality, one does exist, high steam line flow and high steam tunnel temperature should be detected when MSIVs are opened and the MSIV isolation logic should automatically reclose the valves.

(Reference: PSTG 2nd override before step RC/P-2)

LQ/P-6 STABILIZE PRESS **< 1087 PSIG** USING BPV'S
AUGMENTING PRESS CONTROL WITH ANY:

- SRV'S

  IF SUPP POOL LVL **> 5'**

  OPEN SRV'S USING OPENING SEQUENCE A B C

  IF **≤ 200 PSIG** INDICATED ON EITHER ADS N2 BOTTLE HEADER

  PLACE ALL SRV SWITCHES TO OFF

- HPCI CST TO CST MODE
- RCIC CST TO CST MODE
- SJAE
- RFPT
- STEAM SEAL EVAP
- MSL DRAINS
- RWCU RECIRC MODE
  BYPASSING INTERLOCKS AS NECESSARY
  IAW ES-161-002 (ES-261-002)
- RWCU BLOWDOWN MODE ONLY WITH NO BORON INJECTED
  IAW ES-161-001 (ES-261-001)

CAUTIONS

50 ELEVATED SUPP CHMBR PRESS
MAY TRIP RCIC ON HIGH EXHAUST PRESS.

The main turbine bypass valves are the preferred means of controlling RPV pressure, since they provide good control capability, are of relatively large capacity, and do not add heat to the suppression pool. The direction to use the bypass valves implicitly permits opening the MSIVs and placing the main condenser in service if such actions are necessary and conditions permit. It does not, however, constitute authorization to defeat any MSIV isolation interlocks.

If the main turbine bypass valves cannot be used to control RPV pressure, or when the available capacity of the main turbine bypass valves (and main condenser) is less than that required to control RPV pressure below the high RPV pressure scram setpoint, additional systems must be employed to augment RPV pressure control.

Since symptom-oriented procedures must accommodate a full spectrum of initial plant conditions and event scenarios, no prioritization regarding the use of the listed RPV pressure control systems is specified in this step.

If suppression pool water level is not above the top of the SRV discharge device (5'), steam discharged through the SRVs passes directly into the suppression chamber airspace. The magnitude of the resultant primary containment pressure increase could potentially exceed primary containment pressure limits.

When manual SRV actuation is required for RPV pressure control, an opening sequence is preferred which distributes heat uniformly throughout the suppression pool to avoid high local pool temperatures which may result in inefficient pool cooling. The opening sequence also uniformly distributes the total number of SRV actuations among the total number of SRVs.

Purpose of placing SRV switches to "OFF" when ADS nitrogen bottle supply drops to 200 psig is to preserve the remaining pneumatic supply in the 90 psig header so that the non-ADS SRVs will be available if RPV rapid depressurization is later required and ADS valves do not work. The ADS nitrogen bottle supply is the safety-related backup to the 150-psig header. The bottles have a 3-day storage capacity based on the system design leakage rate. A drop in bottle pressure to 200 psig is indicative of a loss of system integrity and the potential loss of the bottles' ability to supply the ADS function. Manual and relief mode operation of SRVs uses pneumatic supply; safety mode does not. By placing SRV control switches to "OFF," the SRVs will open at safety setpoints without expending pneumatic supply, thereby, preserving their availability to rapidly depressurize the RPV if later required. If CIG compressors or IA system (if system crosstied) are in service and maintaining the 90 psig header, continued use of SRV's to stabilize pressure is allowed since the pneumatic supply for valve operation is maintained. The SRV switch is returned to "OFF" when closed. This maintains depressurization function if header pressure is subsequently lost.

PROCEDURE COVER SHEET

PPL SUSQUEHANNA, LLC PROCEDURE	
RPV CONTROL **No changes to the EO Forms (-1 and -2)** **Procedure: Revision 9** ADHERENCE LEVEL: STEP-BY-STEP CONDITIONAL	11/01/2010 EO-000-102 Revision 9 Page 1 of 47

QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE: __________

PERIODIC REVIEW FREQUENCY: 2 YEAR

PERIODIC REVIEW DUE DATE: __________

RECOMMENDED REVIEWS:

Procedure Owner: EOP Coordinator

Responsible Supervisor: Supervisor Operations Engineering

Responsible FUM: Manager-Nuclear Operations

Responsible Approver: Manager-Nuclear Operations

Format→ Para→ PG Break Before

RC/P-2 **IF** ADEQUATE CORE COOLING IS ASSURED
AND
HI DW PRESS ECCS INITIATION SIGNAL **1.72 PSIG** IMMINENT

BEFORE DEPRESSURIZING **< 400 PSIG**

PREVENT INJECTION FROM LPCI AND CS PUMPS

This step is applicable to all subsequent steps within this flowpath. It is applicable whether the step was entered from above, or transfer resulted in entry below this step. It remains applicable to those steps until flowchart is exited.

Low pressure ECCS initiate automatically on a high drywell pressure signal in conjunction with low RPV pressure and begin to inject when RPV pressure decreases below the shutoff head of the pumps. The word "imminent" is used to compensate for the combined initiation signal, since the existence of a high Drywell Pressure and low RPV pressure would result in an ECCS injection. Overriding them is appropriate since uncontrolled injection only complicates actions to maintain control of RPV water level.

This step does not require preventing injection when ECCS pumps start on RPV low level.

The term "prevent" permits securing pumps to preclude injection. The subsequent use of these systems is not prohibited by this override statement when plant conditions change such that system operation is required to assure adequate core cooling.

(Reference: PSTG override before RC/P-1)

RC/P-3 **IF** RAPID DEPRESS IS ANTICIPATED

IRRESPECTIVE OF COOLDOWN RATE
OPEN ALL BPV'S

This step is applicable to all subsequent steps within this flowpath. It is applicable whether the step was entered from above, or transfer resulted in entry below this step. It remains applicable to those steps until flowchart is exited.

This step requires one or more unisolated steam lines, BPV's operable, and the main condenser including circulating water in service.

If it is anticipated that rapid depressurization may soon be required, it is appropriate to discharge as much energy as possible as quickly as possible from the RPV to a heat sink other than the suppression pool. Such action will preserve, for as long as possible, the heat capacity of the suppression pool should rapid depressurization actually become required. For this reason the main turbine bypass valves are the preferred method of depressurization.

Q 86

Same as ADS valves, once bypass valves are opened, they must remain open. The release of radioactivity is prevented by closing the MSIVs if fuel failure is detected.

"Anticipated" implies an expectation that an emergency RPV depressurization requirement cannot be averted by actions prescribed in the EOPs and will soon be reached. The expectation must be based on:

1. An evaluation of plant conditions which includes an extrapolation of parameter trends. This does not include RPV water level. It is inappropriate to allow a loss of RPV water inventory through open BPV's when a decreasing water level trend is occurring.

   For example, an Operator can plot a decreasing suppression pool water level and determine from the trend that level cannot be maintained above 12'. Having made that determination, he would have permission to use Main Turbine Bypass valves to depressurize the RPV until the Rapid Depressurization limit, 12', is reached. The words "cannot be maintained" neither require nor prohibit anticipatory action. Depending upon plant conditions, rapid depressurization may be performed as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached.

   The anticipate step may be executed from every step requiring rapid depressurization except the segment of level control which is applicable when water level drops below -161". This segment includes Steam Cooling and a portion of Alternate Level Control which requires rapid depressurization when level drops to -161". Prior to encountering these instructions, step RC/L-24 directs an exit from the pressure control flowpath (RC/P) which contains the "anticipate" override. To further distinguish rapid depressurization steps that prohibit use of the anticipate override, the instructions state: "GO TO RAPID DEPRESSURIZATION" rather than "RAPID DEPRESSURIZATION IS REQUIRED."

2. An evaluation of the effectiveness of steps preceding the depressurization requirement.

   For example, if drywell temperature is increasing, emergency depressurization should <u>not</u> be "anticipated" in the drywell temperature control leg of Primary Containment Control until the steps addressing operation of drywell cooling and drywell sprays have been performed.

This step authorizes exceeding the technical specification cooldown rate LCO. Cooling down at an accelerated rate is appropriate in order to avoid the need for Rapid Depressurization.

(Reference: PSTG override before RC/P-1)

PROCEDURE COVER SHEET

PPL SUSQUEHANNA, LLC PROCEDURE	
PRIMARY CONTAINMENT CONTROL ADHERENCE LEVEL: STEP-BY-STEP CONDITIONAL	04/25/2011 EO-000-103 Revision 8 Page 1 of 50

QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE: ____________

PERIODIC REVIEW FREQUENCY: 2 Year

PERIODIC REVIEW DUE DATE: ____________

RECOMMENDED REVIEWS:

Procedure Owner: EOP Coordinator

Responsible Supervisor: Supervisor Operations Engineering

Responsible FUM: Manager-Nuclear Operations

Responsible Approver: Manager-Nuclear Operations

SP/T-5 **WHEN** INITIAL ATWS PWR ≤ **5%**
OR
RX SHUTDOWN WITH CONTROL RODS

CONTINUE

Intent of this step is to prohibit execution of subsequent steps if ATWS condition exists.

Fuel damaging, large amplitude power excursions may occur at low RPV pressures if reactor power is > 5%. Also, development of the HCTL assumes that the reactor is shutdown. Therefore, depressurization due to HCTL or PSL is restricted to either: 1) ATWS when initial ATWS power was ≤ 5%; or 2) reactor is shutdown with control rods.

The 5% determination is based on "initial ATWS power," or reactor power before any other steps to reduce reactor power are performed. Refer to LQ-6 for more information on "initial ATWS power level."

This step does not prohibit rapid depressurization when it is required by another step. For example, when two or more area radiation levels exceed Max Safe with a primary system discharging, rapid depressurization is required for that reason and is not prohibited by this step.

EP-DS-005 is a damage control procedure that places RWCU in operation in the blowdown mode. RWCU may only be operated in the blowdown mode if the reactor is shutdown on control rods.

(Reference: SSES-PSTG SP/T-3)

SP/T-8 **WHEN** RPV PRESS
SUPP POOL TEMP AND
SUPP POOL LVL
CANNOT BE MAINTAINED BELOW
FIG **2** HCTL

RAPID DEPRESS IS REQ'D

<u>CAUTION</u>

140 OPERATION OF HPCI OR RCIC
WITH SUCTION FROM SUPP POOL
AND SUPP POOL TEMP **> 140°F**
MAY RESULT IN EQUIPMENT DAMAGE

If initial ATWS power was > 5%, performance of this step would have been restricted. If, following an ATWS of > 5% power, control rods subsequently insert shutting down the reactor, the HCTL must be re-evaluated. If suppression pool temperature and level are above the HCTL, rapid depressurization is required; it may <u>not</u> be deferred to see if parameters will drop below the HCTL. EO-1(2)00-030 Unit 1(2) RESPONSE TO STATION BLACKOUT provides a specific condition where Rapid Depressurization is appropriately restricted when HCTL is exceeded. If during a SBO with HPCI/RCIC maintaining water level **<u>AND</u> <u>NO</u>** low pressure systems (including fire protection) capable of injecting, the SBO procedure provides direction **<u>NOT</u>** to perform a Rapid Depressurization per EO-000-103. If suppression pool temperature and level are <u>below</u> the HCTL, rapid depressurization is <u>not</u> required; actions to maintain temperature and level below the limit are continued.

The HCTL (Heat Capacity Temperature Limit) plots RPV pressure against two suppression pool parameters: temperature and level. This presentation eliminates the need for two curves. (The alternative is to plot suppression pool temperature against RPV pressure on one curve, and suppression pool temperature against suppression pool level on another.) Seven RPV pressure limits are presented, each applicable to a range of RPV pressures. To comply with the HCTL: 1) Observe the current RPV pressure; 2) Select the applicable RPV pressure limit; 3) Ensure the suppression pool temperature and level are maintained below the RPV pressure limit; 4) As RPV pressure changes, select the next applicable RPV pressure limit.

The shape of the HCTL is determined by several competing factors related to the suppression chamber's ability to absorb all energy from an RPV depressurization without exceeding 65 psig in the suppression chamber (operating limit of the suppression chamber vent). Although there is more water available to absorb energy at higher pool levels, the curve drops off as pool level increases. This is because there is less air volume available. The HCTL assumes all non-condensable from the containment are located in the suppression chamber, and that the pool and airspace are in thermal equilibrium. As suppression chamber volume decreases, the temperature at which 65 psig is reached also decreases. So, the suppression chamber's ability to absorb more energy in the larger volume of water is offset by the smaller airspace available to contain the compressed gas.

If RPV pressure, suppression pool temperature and suppression pool level cannot be maintained below the HCTL, the primary containment vent valve opening pressure may be exceeded following RPV depressurization.

The appropriate RPV pressure control flowpath was reached by the requirement for reactor scram in step SP/T-3. The phrase "...cannot be maintained..." denotes an evaluation that considers the current and future values and trends of RPV pressure, suppression pool temperature and suppression pool level.

If rapid depressurization is anticipated and the reactor is shutdown on control rods, Main Turbine Bypass Valves may be used to depressurize the RPV until the rapid depressurization limit, "HCTL," is reached. Permission to use Main Turbine Bypass valves is given in an override located at RC/P-3 of RPV Control. This override allows the TS cooldown limit of 100°F/hr. to be exceeded. The "BPV" symbol is not an instruction; it is attached to step SP/T-8 as a visual *reminder* of an existing instruction at RC/P-3. If the RPV Control procedure is not in use, no permission is given to use the bypass valves. Note, the bypass valve override is not located in EO-000-113, Level/Power Control.

* Only you [illegible] Pwr Cont use Bypass Valves

As explained in SP/T-1, suppression pool temperature indication above 230°F is only available on RHR TEMP MON TRS-E11-1R601(TRS-E11-2R601) provided RHR flow is > 5000 gpm. If, during a transient, suppression pool temperature becomes unavailable due to instrument range limitations, operator response would not be adversely affected for the following reason.

In a transient in which HCTL is being approached and it is forecasted 230°F will be exceeded before the RPV is depressurized, RPV pressure would be approximately 200 psig. Initiating a rapid depressurization at 200 psig before temperature indication goes off scale, although acceptable, would result in minimal benefit since the RPV is, for all intents and purposes, already depressurized.

(Reference: SSES-PSTG SP/T-3)

SP/L-13 **BEFORE** SUPP POOL LVL REACHES 38'

1 SCRAM REACTOR
2. GO TO RPV CONTROL

Damage support procedure EP-DS-002 directs the operation at higher primary containment water levels, but assumes the RPV is depressurized. Performing a reactor scram in accordance with ON-100-101 (ON-200-101) and, entering EO-000-102 at step RC-1 assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before direction is given to depressurize the RPV. Entry into EO-000-102 must be directed because conditions requiring entry into this flowchart do not necessarily require entry into RPV control. Q86

(Reference: SSES-PSTG SP/L-3.2)

WHEN SUPP POOL LVL CANNOT BE MAINTAINED **< 38'**

SP/L-14

1 RAPID DEPRESS IS REQ'D
2 CONTACT TSC TO ENTER EP-DS-002 RPV AND PC FLOODING

At levels above 38', challenges occur with respect to component operability and primary containment structural integrity. For example, at 38' operation of an SRV at its lowest relief setpoint may result in exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports. At 43' the drywell vacuum breakers begin to cover. At 49' suppression chamber spray nozzles are submerged and the range of suppression pool water level instrumentation is exceeded. Operation at these higher levels will require additional resources. Therefore, instructions for operation at these higher primary containment water levels are located in the damage support procedure EP-DS-002.

If rapid depressurization is anticipated and the reactor is shutdown on control rods, Main Turbine Bypass Valves may be used to depressurize the RPV until the rapid depressurization limit, "38 feet," is reached. Permission to use Main Turbine Bypass valves is given in an override located at RC/P-3 of RPV Control. This override allows the TS cooldown limit of 100°F/hr. to be exceeded. The "BPV" symbol is not an instruction; it is attached to step SP/L-14 as a visual *reminder* of an existing instruction at RC/P-3. If the RPV Control procedure is not in use, no permission is given to use the bypass valves. Note, the bypass valve override is not located in EO-000-113, Level/Power Control.

(Reference: SSES-PSTG SP/L-3.2)

Q79 & 86

PROCEDURE COVER SHEET

PPL SUSQUEHANNA, LLC PROCEDURE	
OPERATIONS PROCEDURE PROGRAM ADHERENCE LEVEL: INFORMATION USE	5/13/2011 OP-AD-055 Revision 13 Page 1 of 41

QUALITY CLASSIFICATION:	APPROVAL CLASSIFICATION:
(X) QA Program ( ) Non-QA Program	(X) Plant ( ) Non-Plant ( ) Instruction

EFFECTIVE DATE: ______

PERIODIC REVIEW FREQUENCY: N/A

PERIODIC REVIEW DUE DATE: N/A

RECOMMENDED REVIEWS:

Procedure Owner: Supervisor-Operations Engineering

Responsible Supervisor: Shift Manager-Work Control

Responsible FUM: Manager-Nuclear Operations

Responsible Approver: Manager-Nuclear Operations

4. DEFINITIONS

4.1 AVAILABLE - the state or condition of being ready and able to be used (placed into operation) to accomplish the stated (or implied) action or function. As applied to a system, this requires the operability of necessary support systems (electrical power supplies, cooling water, lubrication, etc.).

4.2 CAN/CANNOT BE DETERMINED - the current value or status of an identified parameter relative to that specified in the procedure can/cannot be ascertained using all available indications (direct and indirect, singly or in combination).

* 4.3 CAN/CANNOT BE MAINTAINED ABOVE/BELOW - the value of the identified parameter is/is not able to be held within the specified limit. The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter *cannot* be maintained above or below a specified limit neither requires nor prohibits anticipatory action – depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached. Once the parameter does exceed the limit, however, the action *must* be performed; it may not be delayed while attempts are made to restore the parameter to within the desired control band.

4.4 CAN/CANNOT BE RESTORED ABOVE/BELOW - the value of the identified parameter is/is not able to be brought within the specified limit. The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter *cannot* be restored and maintained above or below a specified limit does not require immediate action simply because the current value is outside the range, but does not permit extended operation beyond the limit; the action *must* be taken as soon as it is apparent that the specified range cannot be attained.

4.5 HARD CARD - A procedure attachment that summarizes the detailed steps contained in a procedure section. The hard card can be separate from the procedure and used in lieu of the detailed steps in the procedure section.

Susquehanna Learning Center
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Berwick, PA 18603-0467
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ppl™

February 6, 2012

Mr. John Caruso
USNRC Chief Examiner
USNRC Region 1
475 Allendale Road
King of Prussia, PA 19406-1415

Susquehanna Learning Center
Post-Examination Materials
PLA 006813

Dear Mr. Caruso:

In accordance with the guidance provided in NUREG 1021, "Operating Licensing Examination Standards for Power Reactors" (Revision 9, Supplement 1) ES-501 "Initial Post-Examination Activities", the following materials are submitted in support of the Susquehanna Initial Licensing Examination that concluded on January 23, 2012.

1. Form ES-403-1 "Written Examination Grading Quality Checklist", SRO and RO examinations
2. Form ES–401–7/ES–401–8, "Site–Specific Written Examination Cover Sheet" for each applicant
3. The graded, ORIGINAL answer sheet and a clean copy for each applicant
4. All questions asked by the applicants during the administration of the examination and the proctors' responses to those questions
5. Written Examination Seating Chart
6. Examination Analysis
7. SSES Post–Examination Comments

Post-exam analysis indicates 21 questions on the RO examination with potential issues (questions missed by 50 percent or more of the applicants), and three (3) questions on the SRO Examination with potential issues (questions missed by both of the applicants). These are identified on Item #6, Examination Analysis. Investigation to determine if training program deficiencies are indicated and disposition are being tracked by the Corrective Action Program. Faulty questions will be corrected prior to reuse.

Following administration of the Written Examination, the applicants participated in an Exam Review session. Individual knowledge deficiencies were identified and corrected. All comments were discussed with the candidates.

All individuals signed on to Form ES-201-3, "Examination Security Agreement", have not yet completed the post-examination signature. When Form ES-201-3, "Examination Security Agreement", has been completed, it will be forwarded to you, thus completing the necessary documentation for this Susquehanna Initial Licensing Examination.

If you have any questions, or require more information, please contact me at 570-542-3921 or Mike Jacopetti at 570-542-1672 or 3552, or Andy Thompson at 570-542-1891.

Sincerely,

Corey Goff
Manager-Nuclear Training

Response: No

Enclosures: 7 (Listed Above)

cc: J. Goodbred, Jr.
G. van den Berg
M. H. Crowthers
Ops Electronic Letter File
Nuclear Records – NUCPT

CG post-exam memo pla 006813

CG/MJ/vah

Following the administration of the LOC–24 written examination on January 23, 2012, SSES conducted an examination analysis in accordance with NUREG–1021 ES–403 D.3.a and reviewed the results of the preliminary grading and examination analysis with the applicants.

During the exam, the stem to question #85 was revised and this revision was approved by the Chief Examiner. The changes were then provided to the SRO applicants.

From the exam analysis and post–exam review with the applicants SSES has identified problems with three written exam questions (RO 69, SRO 79, and SRO 86) where a change in the answer key is requested. During the exam there were no questions asked by the applicants regarding these three questions. The requested changes to the questions and the bases are described in detail below. The complete examination analysis is included as part of the submittal package.

RO QUESTION 69

Question

Operator A has just removed a Clearance that required Operator B to hold a ladder for 2 of the 10 tags on the clearance. The System Operating Representative is ready to have the Clearance removal Independently Verified (IV).

To independently verify the Clearance removal, the System Operating Representative may use:

A. Operator B, as long as the verification is performed on a different day

B. Operator B for all 10 components

C. Operator B for the 8 tags he did not assist with and Operator C for the remaining 2

D. Neither Operator A nor Operator B

Answer Explanation

A is incorrect. Regardless of separation of time, both Operator A and Operator B were either the performer or in close proximity to the performer, contrary to NDAP–QA–0027

B is incorrect. Operator B was in close proximity during positioning of two components, not eligible to be independent verifier per NDAP–QA–0027 for those two components, but not all ten.

C is correct. Operator B can verify eight of the tags, but cannot verify the two tags for which he/she was holding the ladder. Another operator must be used for these two tags.

D is incorrect. Operator A cannot be his/her own verifier, but Operator B can verify those tags which he/she did not assist with or reposition.

Examination Analysis

Only 1 of 4 applicants selected an incorrect answer to the question.

Recommended Change

Accept distractor D as a second correct answer to the question, in addition to the original keyed answer C.

Justification For Change

The keyed answer for this question is C, and was justified with procedure NDAP–QA–0027. Section 2 of NDAP–QA–0027 provides the following requirements for the extent of a Independent Verifier's involvement with performance of an activity:

> *...The individual performing the verification physically checks the component's condition* ***without relying on observation of*** or verbal confirmation by ***the performer...*** [emphasis added]

NDAP–QA–0027, Section 2 does allow personnel to perform Independent Verification (IV) of activities in which the personnel have participated, with certain restrictions:

> *The verifier cannot be directly involved in an activity while it is being performed. It is, however, acceptable for an individual involved with a test or evolution to perform an IV for an activity within the test or evolution* ***as long as that individual is not present while the activity is performed.*** [emphasis added]

Combining the information in the stem with the additional information presented in distractor C, the scenario assumed in the answer justification meets the requirements of NDAP–QA–0027, and distractor C remains a correct answer.

NDAP–QA–0027 contains additional requirements for verification of clearance order removal beyond those associated with the method to perform Independent Verification. Specifically, Section 6.1.2 specifies verification requirements for removal of clearance orders:

> *6.1.2 Blocking under the Energy Control Process (Clearance Orders)*
>
> *a.* ***Application and removal of blocking*** *on any component, safety related or not,* ***requires Concurrent Verification.*** [emphasis added]
>
> *b. Restoration from blocking on Safety Related Systems requires Independent Verification.*

The process of performing Clearance Order removal is described in NDAP–QA–0322, Energy Control Process. The method for performance of Concurrent Verification of Clearance Order (CO) removal is described in Section 6.12 and Attachment I of NDAP–QA–0322:

> *6.12.4 SOR [System Operating Representative] shall Utilize Attachment E to* ***brief Switchman AND Concurrent Verifier*** *on removing Clearance Order and procedure for restoration of equipment.* [emphasis added]
>
> *6.12.5* ***Switchman and Concurrent Verifier shall*** *Utilize Attachment I, to remove Clearance Order and restore equipment.* [emphasis added]
>
> *Attachment I*
>
> *8.* ***The Concurrent Verifier verifies items above for all EIDs*** *[Energy Isolating Devices] and documents concurrent verification for EIDs not requiring independent verification.* [emphasis added]

The procedure requires two Operators (Switchman and Concurrent Verifier in NDAP–QA–0322 parlance) be briefed and then work together for the removal of a Clearance Order (i.e., to remove the CO and perform Concurrent Verification). A third Operator then performs Independent Verification of the removal of the CO when required.

The stem of the question does not provide all the information necessary to answer the question addressing the procedure requirements for both Concurrent Verification and Independent Verification of Clearance Order removal. The stem states that a Clearance Order being removed by Operator A (i.e., "Switchman") required a second operator (Operator B) to hold a ladder for 2 out of the10 tags. The question stem does not specifically address how the requirements of NDAP–QA–0027 and NDAP–QA–0322 for Concurrent Verification of CO removal is being satisfied. That is, the stem and question do not specify whether Operator B (the assumed Concurrent Verifier) did or did not concurrently verify the entire Clearance Order with Operator A (the Switchman) as would be expected per normal operating practices and in accordance with plant procedures. This critical information was not contained in the question's stem, and could only be inferred from information contained in the C distractor. Since a third operator is not mentioned in the stem, it is reasonable to assume that Operator B was the Concurrent Verifier required by NDAP–QA–0027 and NDAP–QA–0322 for removal of the entire CO and that no ladder was required during removal of the other 8 tags on the CO.

Based solely on the information provide in the stem and not any additional information contained in any distractor, along with knowledge of the procedural requirements for Concurrent Verification of Clearance Order removal, it is reasonable to assume that Operator A and Operator B completed removal of the entire Clearance Order together. Therefore <u>neither</u> Operator A nor Operator B could be used for the Independent Verification making distractor D a correct answer:

D. Neither Operator A nor Operator B

It is the recommendation of SSES to accept D as a second correct answer to this question. Distractor C remains a correct answer as justified in the original submittal. Choices A and B remain incorrect as explained in the original submittal.

<u>References</u>

NDAP--QA–0027, "Station Component Verification Requirements"

NDAP--QA–0322, "Energy Control Process"

SRO QUESTION 79

Question

Given the following conditions:

- Unit 1 ATWS in progress
- Initial ATWS power 4%
- RPV Pressure is 1000 psig, down slowly
- Suppression Pool level is 21 feet, up slowly
- Suppression Pool temperature is 180° F, up slowly

Given the Heat Capacity Temperature Limit (HCTL) curve, select the necessary corrective action in accordance with EO–100–113, "Level/Power Control".

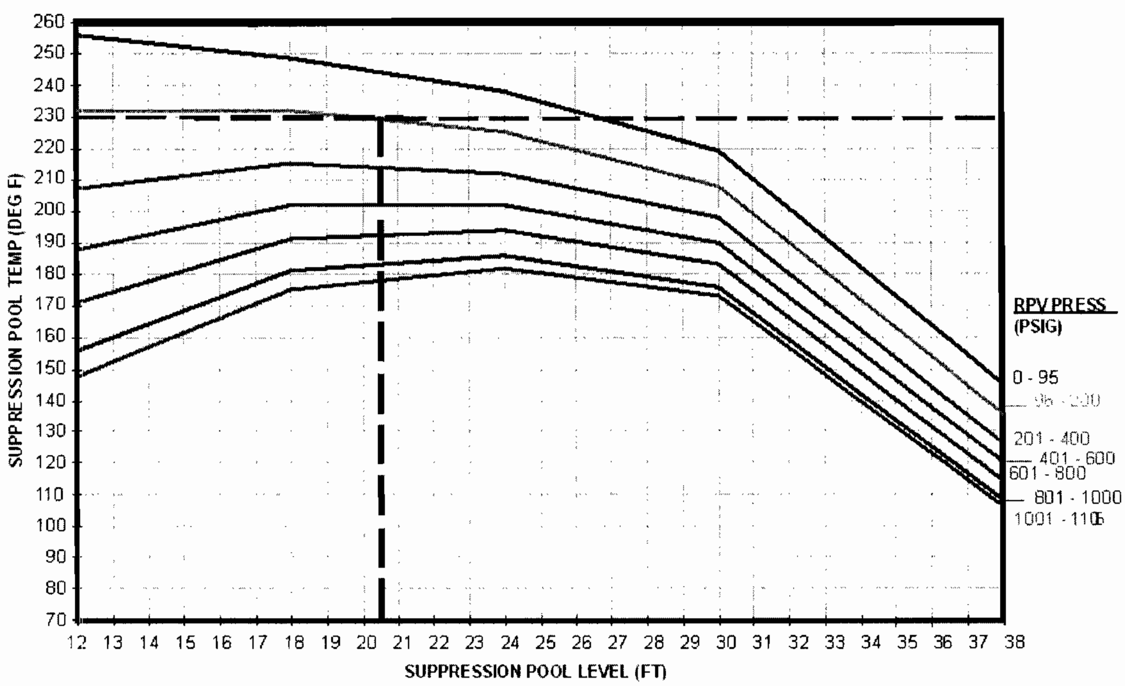
A. Perform EO–100–112, Rapid Depressurization

B. Anticipate Rapid Depressurization by opening all BPV irrespective of cooldown rate

C. Use BPVs to maintain RPV pressure below HCTL, not to exceed 100° F/hr

D. Use BPVs to maintain RPV pressure below HCTL, exceeding 100° F/hr if necessary

FIG 2 HCTL
HEAT CAPACITY TEMPERATURE LIMIT



Answer Explanation

A is incorrect. While Rapid Depressurization is permissible with an ATWS in progress if initial ATWS power <5%, HCTL has not yet been exceeded.

B is incorrect. RPV Pressure reduction is permitted per LQ/P–4 to maintain RPV Pressure below HCTL. Use of bypass valves to rapidly depressurize the RPV if a Rapid Depressurization is anticipated is not permitted while in EO–100–113 Power/Level Control. This is permitted in EO–100–102 RPV control (RC/P–3), however, EO–100–102 RPV control is exited once EO–100–113 is entered for the ATWS. The "BPV" symbol accompanies step SP/T–8 in EO–100–103 and is not an instruction; it is attached to step SP/T–8 as a visual *reminder* of an existing instruction at RC/P–3. If the RPV Control procedure is not in use, no permission is given to use the bypass valves. Note, the bypass valve override is not located in EO–000–113, Level/Power Control. Applicants may confuse this and mistakenly believe that this authorizes them to anticipate Rapid Depressurization and open all BPV with an ATWS in progress.

C is incorrect. HCTL is not currently exceeded, but the limit is being approached. RPV Pressure reduction is permissible during an ATWS to prevent exceeding HCTL if the initial ATWS power <5%; exceeding cooldown rate limits is permitted.

D is correct. HCTL is not currently exceeded, but the limit is being approached. IAW EO–000–113 step LQ/P–4, RPV Pressure reduction is permissible during an ATWS to prevent exceeding HCTL if the initial ATWS power <5%; exceeding cooldown rate limits is permitted.

Examination Analysis

Only 1 of 2 SRO applicants selected an incorrect answer to the question.

Recommended Change

Accept distractor A as a second correct answer to the question, in addition to the original keyed answer D.

Justification For Change

The original correct answer for this question is "D" and was justified with procedure EO–000–113 step LQ/P–4, which states:

IF *INITIAL ATWS PWR ≤ **5%***
AND
*SUPP POOL TEMP AND LVL CANNOT BE MAINTAINED BELOW FIG **2** HCTL*

MAINTAIN RPV PRESS BELOW LIMIT EXCEEDING COOLDOWN RATE IF NECESSARY

The keyed answer to the question presumes that Turbine Bypass Valves may be used to reduce reactor pressure, thereby raising the HCTL limit curve in effect and providing more margin. As the question stem does not specifically eliminate Turbine Bypass Valve availability, the original answer justification is unchanged and D is still a correct answer.

The conditions in the stem also support the conclusion that Turbine Bypass Valves are **not** available. This is due to the very high Suppression Pool temperature of 180 °F with an initial ATWS power level of only 4% rated power, which is well within capacity of the Turbine Bypass Valves. From TM–OP–083–ST

> *The Main Steam System also provides for bypassing reactor steam to the condensers during startup and anytime the quantity of steam produced by the reactor is more than required by the turbine generator. The bypass system can bypass approximately 22 percent of rated steam flow.*

If Turbine Bypass Valves were available the steam would be going to the condenser and Suppression Pool temperature would be significantly lower. Therefore, it can be assumed that reactor pressure is being controlled using SRVs as main steam line drain capacity cannot maintain pressure in a 4% power ATWS.

As an additional confirmation of Turbine Bypass Valves being unavailable, the question stem specifies RPV Pressure is 1000 psig and slowly lowering This is not the expected reactor pressure response for Turbine Bypass Valve normal operation post–scram. Step 5.55 of GO–100–002, Plant Startup, Heatup and Power Operation, specifies the following for setup of EHC during reactor startup:

> *5.55 Slowly Adjust EHC Pressure Setpoint in order to close the Main Turbine Bypass Valves, maintaining Pressure Setpoint 50–100 psig greater than Reactor Pressure up to the required final setting required to achieve the desired final RPV Pressure of 934 psig.*

With EHC Pressure Setpoint at 934 psig, there is sufficient Turbine Bypass Valve capability for a 4% initial power ATWS to maintain reactor pressure stable and near the 934 psig Pressure Setpoint, well below the 1000 psig reactor pressure specified in the stem of the question. Based on this normal plant line–up and the current plant conditions listed in the stem, it is apparent that Turbine Bypass Valves are not controlling reactor pressure as expected.

Step LQ/P–4 bases in EO–100–113 states the following regarding use of Safety Relief Valves (SRV) for maintaining HCTL in an ATWS condition:

> *If SRVs are used to maintain RPV pressure below the HCTL, the margin to the limit will not improve; that is, the delta between containment parameters and the HCTL will not increase. This is because SRV use adds heat to the suppression pool, and suppression pool temperature is one of the three factors that is included in the HCTL.*

The limit curve in effect on the HCTL graph is for 801–1000 psig based on current conditions from the stem. Despite the lowering trend in reactor pressure, a significant reduction in pressure (200 psi) is required to reach the next lower limit curve and provide additional margin to exceeding HCTL.

From the conditions in the stem step SP/T–2 of EO–100–103 is applicable, which states

WHEN *SUPP POOL TEMP CANNOT BE MAINTAINED < **90°F***

MAXIMIZE SUPP POOL COOLING UNLESS RHR PUMPS CONTINUOUSLY NEEDED FOR ADEQUATE CORE COOLING

With reactor pressure at 1000 psig RHR pumps are not continuously needed for adequate core cooling. RHR should be available to be placed in service in the Suppression Pool cooling mode with cooling maximized. A Suppression Pool temperature of 180° requires either a fault in one or both divisions of RHR that prevent placing Suppression Pool cooling in–service, or credit the assumption that the energy deposition into the Suppression Pool exceeds the capability of RHR in the Suppression Pool cooling mode.

Procedure OP–AD–055, Operations Procedure Program, Step 4.3, provides this definition of Cannot Be Maintained to be applied in EOP execution:

> *...The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter cannot be maintained above or below a specified limit neither requires nor prohibits anticipatory action – depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached...*

Given the conditions in the stem no means of lowering Suppression Pool temperature is available. From the rising trend in Suppression Pool temperature and the small margin to the curve it is apparent that the HCTL curve will be exceeded. Per the EO–100–113 bases for step LQ/P–4 SRVs will not be effective in restoring HCTL margin. Under these conditions the appropriate determination is that Suppression Pool level and Suppression Pool temperature **cannot be maintained** below HCTL.

Since initial ATWS power level is <5%, EO–100–103 step SP/T–5 allows proceeding with the Suppression Pool temperature control leg:

WHEN *INITIAL ATWS PWR ≤ **5%***
OR
RX SHUTDOWN WITH CONTROL RODS

CONTINUE

Suppression Pool Temperature Leg step SP/T–8 directs Operators to perform a Rapid Depressurization IAW EO–100–112:

WHEN *RPV PRESS*
SUPP POOL TEMP AND
SUPP POOL LVL
CANNOT BE MAINTAINED BELOW
FIG 2 HCTL

RAPID DEPRESS IS REQ'D

To implement the Rapid Depressurization under ATWS conditions, actions are also required in the Power/Level Control contingency procedure EO–100–113. The override in step LQ/L–10 of EO–100–113 is applicable under the ATWS conditions described in the stem:

IF *RAPID DEPRESS REQ'D*

GO TO LQ/L 18

Execution of the override requires additional steps in EO–100–113 to be performed, prior to initiating the Rapid Depressurization per EO–100–112. This includes the significant action of terminating and preventing injection into the reactor as specified in Step LQ/L–18:

STOP INJECTION
AND
PREVENT INJECTION

FROM:

- *FW*
- *COND*
- *LPCI*
- *CORE SPRAY*

This step prevents uncontrolled injection of large amounts of cold water as RPV pressure decreases below the shutoff head of operating system pumps and reduces the possibility that large reactor power excursions and subsequent core damage occur during the depressurization.

Knowledge of the significant actions to be performed in EO–100–113 to support the Rapid Depressurization makes distractor A a correct answer to the question of the corrective action required per EO–100–113:

A. Perform EO–100–112, Rapid Depressurization

It is the recommendation of SSES to accept A as a second correct answer to this question. Choice D remains a correct answer as justified in the original submittal. Choices B and C remain incorrect as explained in the original submittal.

References:

EO–000–103, Primary Containment Control

EO–000–113, Power / Level Control

OP–AD–055, Operations Procedure Program

GO–100–002, Plant Startup, Heatup And Power Operation

SRO QUESTION 86

Unit 1 was at 100% when the following conditions occur:

- A transient occurred that has caused Suppression Pool Level to rise.
- Attempts to Lower Suppression Pool level in accordance with OP–159–001 Suppression Pool Cleanup System were unsuccessful.
- HPCI and RCIC were placed on MIN Flow at 25 feet in the Suppression Pool.
- At 35 feet in the Suppression Pool level, Rx SCRAM was performed IAW ON–100–101 and EO–100–102, RPV control was entered at step RC–1.
- Suppression Pool Level is now 35.5 feet and rising slowly.

In accordance with EO–100–103, "PC Control", which one of the following steps would be correct and why?

A. Open ALL BPVs because drywell vacuum breakers are beginning to become submerged.

B. Rapid depressurization because drywell vacuum breakers are beginning to become submerged.

C. Open ALL BPVs to depressurize the RPV prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

D. Rapid depressurization prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

Answer Explanation

A. **Incorrect but plausible:** Plausible, partially correct that if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve may be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached, however, the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports. At 43' the drywell vacuum breakers begin to cover.

B. **Incorrect but plausible:** Plausible if the applicant does not recall rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve may be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached.

C. **Correct:** Rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve should be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached, the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports.

Note: HPCI and RCIC were placed in min flow because EO–100–103, requires HPCI and RCIC to be started prior to reaching 25', because if pool level were above 25', water could enter the exhaust piping and a high exhaust pressure would occur when the system is started due to inertial effect of water in the piping. This could potentially cause the system to trip on high turbine exhaust pressure. Therefore, both HPCI and RCIC are ensured to be running when pool level reaches 25'.

D. **Incorrect but plausible:** Plausible, partially correct that if the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports, however if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve should be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached.

Examination Analysis

Both SRO applicants selected an incorrect answer to the question.

Recommended Change

Accept distractor D as a second correct answer to the question, in addition to the original keyed answer C.

Justification For Change

The original correct answer for this question is C and was justified with procedure EO–100–103 step SP/L–14, the bases for which states:

If rapid depressurization is anticipated and the reactor is shutdown on control rods, Main Turbine Bypass Valves may be used to depressurize the RPV until the rapid depressurization limit, "38 feet," is reached.

The original answer justification is unchanged, and distractor C is still a correct answer.

Choice D was originally justified as wrong with this statement:

Plausible, partially correct that if the reason for depressurization is to prevent exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports, however if rapid depressurization is anticipated and the reactor is shutdown on control rods, then Main Turbine Bypass Valve ***should*** *be used to depressurize the RPV until the rapid depressurization limit, "38 Feet" is reached. Note that 38 feet is not yet reached.* [emphasis added]

The stem of the question asks for the "correct action" to take per EO–100–103 in response to an ongoing transient that has resulted in a Suppression Pool level high enough to warrant reactor scram, with pool level continuing to rise. The nature of the

transient causing the rising Suppression Pool level is not described in the stem of the question. The inleakage into the Suppression Pool must be severe, to raise level over 11 feet above normal operating levels. This represents an influx of over 440,000 gallons.

The stem states that the reactor was scrammed at 35 feet in the Suppression Pool. A reactor scram is inserted in EO–100–103 Step SP/L–13 in anticipation of a Rapid Depressurization:

> *Performing a reactor scram in accordance with ON–100–101 (ON-200-101) and, entering EO–000–102 at step RC–1 assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before direction is given to depressurize the RPV.*

This action was taken conservatively, based on the 3 foot margin to the Suppression Pool high–level Rapid Depressurization limit. Following the scram an additional influx of 20,000 gallons has occurred based on the additional 0.5 foot rise in pool level, and pool level continues to rise. Given the continuing rise in Suppression Pool level and that previous attempts to lower Suppression Pool level failed, the inleakage into the Suppression Pool continues post–scram and no viable method of stopping the inleakage or lowering Suppression Pool level exists.

EO–100–103 step SP/L–14 states:

> ***WHEN*** *SUPP POOL LVL CANNOT BE MAINTAINED < **38'***
>
> *1 RAPID DEPRESS IS REQ'D*
> *2 CONTACT TSC TO ENTER*
> *EP DS 002 RPV AND PC FLOODING*

The bases of this step indicate that equipment damage is possible due to SRV operation at this Suppression Pool level:

> *At levels above 38', challenges occur with respect to component operability and primary containment structural integrity. For example, at 38' operation of an SRV at its lowest relief setpoint may result in exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports.*

Procedure OP–AD–055, Operations Procedure Program, Step 4.3, provides this definition of Cannot Be Maintained to be applied in EOP execution:

> *...The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter cannot be maintained above or below a specified limit neither requires nor prohibits anticipatory action – depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached...*

Given the severe inleakage into the Suppression Pool, that the inleakage continues, and that efforts undertaken to reduce Suppression Pool level have failed, it is apparent that the limit will ultimately be exceeded. With the declaration that Suppression Pool level cannot be maintained less than 38 feet, Rapid Depressurization is required per EO–100–103 step SP/L–14.

The stem specifically asks what action is correct per EO–100–103. The Bypass Valve "reminder" symbol that allows depressurization with Bypass Valves is located in EO–100–103 on step SP/L–14. The bases for step SP/L–14 in EO–100–103 provide this additional clarification on the requirements for use of the Turbine Bypass Valves in this situation

> *The "BPV" symbol is not an instruction; it is attached to step SP/L–14 as a visual reminder of an existing instruction at RC/P–3.*

The bases for step RC/P–3 in EO–000–102 provide the following guidance for use of Turbine Bypass Valves in anticipation of Rapid Depressurization:

> *"Anticipated" implies an expectation that an emergency RPV depressurization requirement cannot be averted by actions prescribed in the EOPs and <u>will soon be reached</u>. The expectation must be based on:*
>
> *1. An evaluation of plant conditions which includes an extrapolation of parameter trends…*
>
> *… The words "cannot be maintained" neither require nor prohibit anticipatory action. Depending upon plant conditions, rapid depressurization* ***may be performed as soon as it is determined that the limit will ultimately be exceeded****, or delayed until the limit is actually reached…*[emphasis added]

While EO–100–102 indicates a preference for use of the Turbine Bypass Valves, plant conditions must be established to support the depressurization. With the reactor scrammed EO–100–102 Step RC/P–1 must be evaluated for applicability.

> ***IF*** *ADEQUATE CORE COOLING IS ASSURED*
>
> ***BEFORE*** *DEPRESSURIZING <* ***700 PSIG***
>
> *PREVENT UNCONTROLLED COND INJECTION*

As the conditions in the question do not indicate concerns for adequate core cooling, the condensate system must be aligned to prevent uncontrolled injection before lowering reactor pressure below 700 psig using Turbine Bypass Valves. The bases for step RC/P–1 specify the normal means of aligning condensate prior to use of the Turbine Bypass Valves to initiate RPV depressurization:

> *If the RPV is depressurized to less than 700 psig without the reactor feed pump discharge valves closed and the condensate system is in service, then an*

> *uncontrolled flood of the RPV will take place as condensate water injects through the feed pumps into the RPV.* ***Normally, Condensate system injection is controlled by placing Feedwater in startup level control.*** [emphasis added]

Step RC/P–1 maintains the availability of Condensate as the primary means of reactor vessel inventory makeup during the RPV depressurization. Tripping the condensate pumps would **not** be appropriate to prevent uncontrolled injection.

The requirement for preventing uncontrolled condensate injection prior to Rapid Depressurization is specified in EO–100–112 Step RD–3.

> *PREVENT UNCONTROLLED COND INJECTION*
> *EXCEPT AS REQ'D TO ASSURE*
> *ADEQUATE CORE COOLING*

The bases for this step do not describe a preferred method for accomplishing the necessary condensate lineup

> *This step is applicable as long as it does not conflict with restoring or assuring adequate core cooling.*
>
> *If the RPV is depressurized to less than 700 psig without preventing uncontrolled condensate injection then an uncontrolled flood of the RPV will take place as condensate water injects through the feed pumps into the reactor.*

Once Rapid Depressurization is required, prompt action is required to establish the conditions necessary. Tripping the condensate pumps **would** be appropriate if necessary to prevent uncontrolled injection.

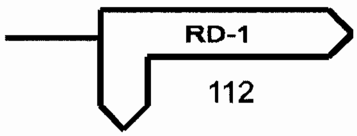
Conditions must be evaluated to determine whether the time available before Suppression Pool level reaches 38 feet, when Rapid Depressurization becomes required by EO–100–103, allow for realigning the condensate system for startup level control and fully opening the Turbine Bypass Valves. The question specifies that Suppression Pool level rose 0.5 feet in the time between inserting a reactor scram per ON–100–101 and entering EO–100–102. Performance of immediate operator actions post–scram, providing an initial scram report, and Unit Supervisor evaluation of plant conditions and decision to enter EO–100–102 can be assumed to occur in a brief interval, as soon as one minute. Given this 0.5 foot/minute rate of Suppression Pool rise, the 38 foot limit where Rapid Depressurization is required will be reached in approximately 5 minutes.

At SSES the feedwater Integrated Control System is designed to automatically align condensate and feedwater systems for startup level control. Uncontrolled condensate injection is prevented by full closure of the reactor feedpump isolation valves HV-10603A(B)(C). The SSES simulator was used to determine that the nominal time from reactor scram until all three HV–10603 valves are closed is approximately 4.5 minutes. The next appropriate action to mitigate the event is to initiate a RPV depressurization by fully opening the Turbine Bypass Valves.

RPV depressurization is not assurance of mitigation of the rising Suppression Level trend and maintaining Suppression Pool level below 38 feet, as the nature of the inleakage is unspecified. As previously noted, given the severe inleakage into the Suppression Pool, that the inleakage continues, and that efforts undertaken to reduce Suppression Pool level have failed, it is apparent that the limit will ultimately be exceeded. It is reasonable for the applicant to assume that the question requires a determination of the ultimate mitigating action that will be required by EO–100–103 for the transient, based on the wording of the question

> *In accordance with EO–100–103, "PC Control", which one of the following steps **would be** correct and why?*

Performing Rapid Depressurization will be required per EO–100–103 Step SP/L–14 when Suppression Pool level reaches 38 feet. The instruction in EO–100–103 Step SP/L–14 for Rapid Depressurization requires entry into EO–100–112 via the concurrent exit and continue arrow on EO–100–103 Step SP/L–14.



Regardless of the state of the Turbine Bypass Valves, all Automatic Depressurization System valves will have to be opened per E0–100–112 Step RD–8 when Suppression Pool level reaches 38 feet. This makes choice D a second correct answer to the question.

D. Rapid depressurization prior to exceeding the capability of the SRV tail pipe and tail pipe supports.

It is the recommendation of SSES to accept D as a second correct answer to this question. Choice C remains a correct answer as justified in the original submittal. Choices A and B remain incorrect as explained in the original submittal.

<u>References:</u>

EO–000–103, Primary Containment Control

EO–000–102, RPV Control

OP–AD–055, Operations Procedure Program