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U.S. Nuclear Regulatory Commission
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Byron Station, Unit 1
Facility Operating License No. NPF-37
NRC Docket No. STN 50-454

Subject: Response to Request for Additional Information Regarding the Byron Station, Unit 1, Loop Stop Isolation Valve

Reference: Letter from G. F. Dick (U. S. NRC) to C. M. Crane (Exelon Generation Company, LLC), "Byron Station, Unit 1 - Request for Additional Information Related to the 1C Loop Stop Isolation Valve," dated May 4, 2005

During the review of a petition submitted in accordance with 10 CFR 2.206, "Requests for action under this subpart," the NRC determined that certain information should be formally submitted on the station's docket. The specific information request provided to Exelon Generation Company, LLC (EGC) in the referenced letter. The attachments to this letter provide the requested EGC information.

Should you have any questions concerning this submittal, please contact David J. Chrzanowski at (630) 657-2816.

Respectfully,

Joseph A. Bauer

Joseph A. Bauer
Manager – Licensing

Attachment 1: Response to Request for Additional Information – Byron Station, Unit 1, Loop Stop Isolation Valve

Attachment 2: Plant Issue Resolution Documentation #2005-02, Revision 1

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Attachment 1
Response to Request for Additional Information
Byron Station, Unit 1, Loop Stop Isolation Valve

Response to NRC Request for Additional Information (RAI)
Regarding the Byron Station, Unit 1
Loop Stop Isolation Valve, 1C
(Equipment Tag 1RC8002C)

<u>NRC RAI Question #1</u>

Please provide material properties of the valve guides and related information that demonstrate their capability to maintain structural integrity under the load exerted by the 1RC8002C motor actuator during a worst-case misalignment orientation.

<u>Response to RAI Question #1</u>

The guide is fabricated from hardened stainless steel (i.e., American Iron and Steel Institute A 410 specification) with a minimum specified yield strength of 140 ksi and an ultimate strength of 165 ksi. Based on the current configuration of loop stop isolation valve, 1RC8002C, the maximum output of the Limitorque motor operated valve actuator is approximately 75,000 lbs stem thrust based on the measured motor current at the torque switch trip setpoint. It has been concluded that it will require greater than 100,000 lbs force to cause deformation during a worst-case misalignment orientation resulting from the valve guide resting at the bottom of the valve. Even under these conditions, structural integrity of the valve guide is maintained.

The calculated section properties of the guide used in this evaluation are as follows:

$A = 3.9\ in^2$	cross-sectional area,
$L = 39\ in$	approximate length of guide,
$I_1 = 0.919\ in^4$	moment of inertia about the weak axis,
$S_1 = 0.819\ in^3$	section modulus about the weak axis,
$I_2 = 7.48\ in^4$	moment of inertia about the strong axis, and
$S_2 = 3.74\ in^3$	section modulus about the strong axis.

No formal calculations have been performed in evaluating the guide integrity; however, using a very simplified approach, three misalignment positions (as illustrated below) were considered for the guide to evaluate the potential for significant damage up to and including fracture. The results of these three cases are based on standard equations used in determining moments of inertia, bending moments and total stresses in the mispositioned guide.

The guide position cases considered include:

Position 1

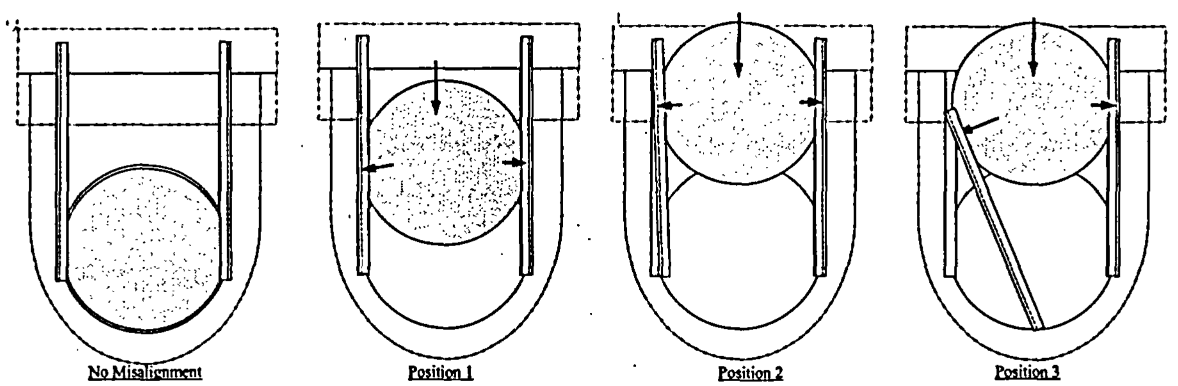
The valve guide on the shelf of its retaining groove with a misalignment of approximately one degree. For this location, the valve disk is assumed to contact the guide at its mid-height.

Position 2

The valve guide on the edge of the shelf with a misalignment of approximately four degrees. Based on valve geometry, the disk would contact the guide at approximately 1/4th its length.

Position 3

The valve guide end resting at the bottom of the valve. This would result in an angle of approximately 20 degrees. At this position, the valve disk would be bound up against the guide at approximately 1/10th its length. In addition, a 10-degree misalignment is also considered in the direction along the flow.



In estimating these forces, the guide positioning and the disk-to-guide point of impact are approximated from the dimensions on the loop stop isolation valve (LSIV) outline drawing (DWGC 116E26).

For position 1, the guide is postulated to be slightly out of alignment. The thrust force required to yield the guide was calculated assuming this guide takes 100% of the thrust force generated by the valve operator. Considering the guide as a simple beam supported at its ends, the normal force (i.e., perpendicular to the guide) required to yield the guide is 11,700 lbs. At one degree, this corresponds to a vertical thrust force greater than 600,000 lbs. The deflection of the guide was also calculated at the mid-height based on the load required to yield the guide. The calculated deflection at the mid-height is approximately 1/2-inch, which is greater than the offset of the guide; thus, the guide would deflect into the retaining groove in the valve body resulting in additional support of the guide before it could reach the yield limit of the guide material.

In position 2, the guide is postulated to be at the edge of the guide support shelf (i.e., angle of the guide at approximately four degrees). The normal force was recalculated assuming the disk contact point was at 1/4 of the guide length (L/4). The force required to yield the guide is 15,700 lbs. This corresponds to a full thrust force of 225,000 lbs.

Position 3 considered the valve guide at the bottom of the valve body with 20 degree misalignment plus 10 degree misalignment in the direction of the flow. This configuration will result in biaxial bending of the guide. At this location the disk makes contact with the guide at approximately 1/10 its length. The thrust force acting on the guide required to cause yielding of the guide under these conditions is approximately 85,000 lbs. Considering the thrust is also resisted by the other guide from friction caused by the lateral shifting of the disk due to misalignment of the opposite guide, the total thrust required to cause deformation will be much greater, i.e., in the 100,000 to 150,000 lb range.

LSIV thrust and torque has not been monitored during the closing or opening strokes; however, the motor currents are monitored at the motor control center. Torque and thrust can be approximated using known values based on the torque switch setting, motor current and the valve stem factor. Utilizing motor current to approximate actuator output torque is the most conservative approach. Based on 1959 ft-lbs of motor gearing capacity under ideal stem lubrication conditions, the resulting stem thrust is approximately 75,000 lbs of stem force and therefore less than the estimated 100,000 lbs to 150,000 lbs required to deform the valve guide. The 1959 ft-lbs value is based on conservative inputs to Limitorque's equation for motor gearing capacity.

<u>NRC RAI Question #2</u>

Given the multiple closing attempts needed to close 1RC8002C in refueling outages 11, 12, and 13, please describe Exelon's corrective actions to address any potential concerns related to structural integrity and loose parts generation.

<u>Response to RAI Question #2</u>

The valve High Impact Team (HIT) plan includes stroking of the valve while monitoring current, followed by manual closure of the valve. Repairs to 1RC8002C will be conducted as a contingency action in the event that the valve does not close or if closure during the outage indicates that there could be damage to the valve internals. Byron Station Plant Engineering Department (PED) is currently developing a long-term plan that will identify any additional diagnostic testing or inspection to be performed to assess LSIV performance during future outages. The long-term plan will also address how the loose parts monitoring system will be used in diagnosing any issue involving the 1C LSIV. This action has been entered into the Station's Corrective Action Program and is scheduled for completion by September 1, 2005.

The foreign material evaluations previously performed (see Attachment 2) address the impact of any loose parts generation. The types of foreign material postulated were those originating from the LSIV and included two guides, three pins, guide stops and a valve fragment. These evaluations concluded that there is no safety impact on the fuel or associated reactor coolant system (RCS) components.

NRC RAI Question #3

Please provide any long-term plan for resolving the degraded condition of 1RC8002C including corrective maintenance activities, future diagnostic testing, verification of valve guide integrity, criteria for taking action in response to diagnostic test results, and resolution of poor performance of plant loop stop isolation valves.

Response to RAI Question #3

As described above, Byron Station PED is developing a long-term plan that identifies any additional diagnostic testing or inspection to be performed to assess LSIV performance during future outages. The long-term plan will also address how the loose parts monitoring system will be used in diagnosing any issue involving the 1C LSIV.

NRC RAI Question #4

Please provide a copy of the revised Issue Resolution Documentation Form #2005-02 regarding delay of corrective maintenance for 1RC8002C that includes topics relative to the following: evaluation of the structural integrity of the valve guides; consideration of applicable design-basis events with 1RC8002C remaining in a degraded condition for a long period of time such as the potential for and consequences of a valve disc falling into the reactor coolant system (RCS) flow stream, and impact of a significant loose part on the reactor fuel in the event of a hot-leg line break; confirmation of proper installation of the valve blocks in 1RC8002C; explanation of the cause of the multiple strokes necessary to close 1RC8002C; and the potentially increased likelihood of loose parts with degraded guides in 1RC8002C and of increased wear of RCS components from a large loose part.

Response to RAI Question #4

The revised Issue Resolution Documentation #2005-02, Revision 1 is provided in Attachment 2. The requested information is discussed in this document. The situation of the valve disc falling into the RCS was not discussed in the Resolution Document since this was not considered a credible scenario based on industry experience. However, if the disc were to fall into the RCS, the consequences of this failure are bounded by the locked rotor accident analysis.

The increased wear of RCS components from a large loose part were considered. The loose parts monitoring system is capable of identifying a large loose part and the actions taken as a result are documented in the response to RAI question #5.

NRC RAI Question #5

Please provide a discussion of the Byron loose parts monitoring process that describes timely actions in response to loose part detection as needed, including the following information: (a) what type of alert or alarm is given when a loose part is detected; (b) the action taken by the operator in response to a loose parts monitor alarm; (c) the criteria used to judge whether continued plant operation is appropriate given indication of loose parts, and (d) procedures for use of the loose-parts monitoring system and actions *to be implemented in the event of the identification of loose parts in the RCS during plant operation.*

Response to RAI Question #5

The Loose Parts Monitoring System (LPMS) function is to automatically detect metal-to-metal type impacts that may be indicative of a loose part in the RCS. The LPMS consists of 12 accelerometers installed on the natural collection regions of the RCS. Both an active and standby sensor is located at the reactor vessel upper head, reactor vessel lower head, and primary side of each steam generator. The LPMS also consists of 12 sensors located on other components such as each reactor coolant pump and the secondary side of each steam generator to provide additional monitoring capabilities. The LPMS is capable of monitoring any combination of 16 sensors at one time.

(a) What type of alert or alarm is given when a loose part is detected

The LPMS provides two types of alarms: one is an equipment failure alarm and the other is a loose part alarm. Both types alarm in the main control room to alert operators that the LPMS has detected a possible loose part. The LPMS also provides local audible and visual indications to help validate the cause of an alarm.

(b) The action taken by the operator in response to a loose parts monitor alarm

Operators respond as directed by Byron Station Annunciator Response (BAR) procedures. The BAR associated with the LPMS is 1(2) BAR 1-13-E9, "Loose Parts Monitoring System Trouble," which directs the operator to evaluate if the alarm is from equipment failure or a valid loose part alarm. If during this review, Operations personnel conclude that a possible valid loose part is causing the alarm condition, PED is notified to investigate.

(c) The criteria used to judge whether continued plant operation is appropriate given indication of loose parts

Operators make the first determination as to the cause of the alarm based on guidance provided in Byron Station operating procedure BOP LM-5, "Loose Parts Monitoring System Operation and Alarm Response." This guidance is as follows:

1. *The following conditions are indicative of a Loose Part freely migrating through the system:*
    a. *Noise is periodic (irregular occurrence, not oscillatory).*
    b. *Magnitude is random.*
    c. *Noise is of more than one sound type (see below).*
2. *The following conditions are indicative of a Loose Part which is captive:*
    a. *Noise is periodic on occasion.*
    b. *Magnitude is consistent.*
    c. *Noise is usually of one sound type (see below).*
3. *Size and Type:*
    a. *Tinny sound - Lightweight (< 1 1b.), thin, plane-like object.*
    b. *Hollow or ringing sound - Piping or doomed structure, thin wall (1 in. or less) high frequency, thick wall (greater than 1 in.) if low frequency.*

c. *Billiard ball sound - Light, elastic, high velocity Loose Part colliding with massive fixed structure.*
d. *Dull sounds (thuds) - Massive object.*

Operators will forward relevant information to PED for review. PED will review the alarms and visual indications from the LPMS to determine the probable cause. If it is determined that a possible loose part exists, PED would contact the vendor for additional technical input and may bring the vendor on-site to validate the response of the LPMS. A decision on continued plant operation would be determined by the Plant Operations Review Committee.

(d) Procedures for use of the loose-parts monitoring system and actions to be implemented in the event of the identification of loose parts in the RCS during plant operation.

The following procedures are utilized when the LPMS alarms:

- BAR 1-13-E9, "Loose Parts Monitoring System Trouble." This procedure directs operations personnel to locally investigate the cause of the LPMS alarm.

- BOP LM-5, "Loose Parts Monitoring System Operation and Alarm Response." In addition to placing the LPMS in-service, this procedure provides guidance on response to LPMS alarms.

Actions to be taken if an actual loose part is detected in the RCS are described in part (c) above.

<u>NRC RAI Question #6</u>

The Byron UFSAR, Section 5.4, discusses the Byron compliance with the NRC cold shutdown position, RSB 5-1 . This UFSAR Section appears to show that Byron 1 can be shut down from full power without using the CVCS letdown or the pressurizer spray systems. Please verify that the discussion in this UFSAR Section does confirm that Byron cold shutdown can be achieved without using CVCS letdown and pressurizer spray, and that Byron, Unit 1 continues to meet the requirements of Standard Review Plan Section 5.4.7, RSB Branch Technical Position 5- .

<u>Response to RAI Question #6</u>

As described in updated Final Safety Analysis Report (UFSAR) section 5.4.7.2.7, "System Operation," Byron Station is in compliance with Branch Technical Position (BTP) RSB 5-1, "Design Requirements of the Residual Heat Removal System (RHR)." This BTP required Byron Station to evaluate its capability to go from normal operating conditions to cold shutdown under a natural circulation cooldown scenario with limited functional capability including a loss of RCS letdown and without pressurizer spray.

The NRC confirmation of this capability was documented in NUREG-0786, "Safety Evaluation Report Related to the Operation of Byron Station Units 1 and 2," Supplement 2, Section 5.4.3, "Residual Heat Removal System." This capability was re-confirmed for

Byron Station for replacement steam generators and uprated power conditions. This re-evaluation is documented in design analysis CN-RRA-00-47, "Byron/Braidwood Natural Circulation Cooldown TREAT Analysis for the RSG and Uprating Program."

NRC RAI Question #7

Please describe the assessment of a 3/16 x 5/8 inch metal debris found in the reactor vessel in refueling outage B1R13.

Response to RAI Question #7

Foreign material identified on the lower core plate during the Unit 1 Spring 2005 refueling outage (i.e., B1R12) was reviewed by Westinghouse and determined not to be from any recent degradation of the LSIV. Based on the dark color of the item and its associated dose rate, it appears that the item has been in the RCS for a significant period of time; perhaps several cycles.

Attachment 2

Plant Issue Resolution Documentation

#2005-02, Revision 1

PLANT ISSUE RESOLUTION DOCUMENTATION

DATE 04/01/05 SER# 2005-002 R/1

SYSTEM\COMPONENT:
1RC 8002C - 1C Loop Stop Isolation Valve (LSIV) Design Function - The design function of the LSIVs is to isolate each reactor loop, Reactor Coolant Pump and associated Steam Generator from the Reactor Vessel. This prevents reactor vessel water from entering the Steam Generators when the reactor cavity is flooded during refueling. Per Byron Technical Specification 3.4.4, the valves are required to be opened in modes 1 and 2, since all reactor coolant loops must be in operation. In addition, the valves are opened and de-energized in modes 1 through 4 in accordance with Technical Specification 3.4.17 to ensure adequate boron mixing. The LSIVs are not credited in any emergency (BEPs) or abnormal operating (BOAs) procedures.
DECISION TO BE MADE:
Determine whether valve guide repair on the 1RC 8002C (1C LSIV) is to be performed during the B1R13 refueling outage or whether the work should be considered as a contingency and performed only in the event the valve cannot be closed or if closure during B1R13 indicates there would be further damage to the valve internals. Background – During the previous two Unit 1 refueling outage (B1R12 and B1R11) difficulties were encountered during closure of 1RC 8002C. During B1R11, 1RC 8002C closed after the sixth attempt. During each attempt the valve partially closed, with each attempt achieving further closure. During B1R12, the valve closed following the third attempt. Industry experience (including Byron and Braidwood) identifies that other cold leg LSIVs have had the same difficulty. The failures have been due to a guide shifting in the valve preventing full travel of the valve disc. The shifting of the guide has been the failure of a spring pin, which is used to keep the guide in the valve body. No failures have been identified with the hot leg LSIVs. There were minor indications noted in the current traces on the 1B hot leg LSIV during B1R12, however there was no problem with closure during that outage. The general industry experience has shown that loose parts are not expected from hot leg LSIV's. Based on information provided by Westinghouse, when indications from a plants loose parts monitoring system have been reported for the RCS hot leg portion and its components, the loose part has not come from the hot leg LSIV.
KEY STAKE HOLDERS:
Engineering – B. Adams Operations – K. Ferneau Radiation Protection – D. Palmer Project Management – D. McLaughlin Venture (installing department) – D. McLaughlin (assigned to organization as part of installation) Information and insights were provided by the above personnel for use in the decision making process.
DECISION MADE:
Repairs for 1RC 8002C will be conducted as a contingency in the event that the valve does not close or if closure during B1R13 indicates that there would be further damage to the valve internals. The following is a summary of the items considered during the review of the risks associated with the decision. • The condition of the 1C LSIV does not present a unique condition for the generation of loose parts. The potential of generating a loose part from the the 1C LSIV is considered to be a low probability event with a low safety significance. • Impact on nuclear safety as it relates to foreign material impacts has been previously evaluated and those prior evaluation bounds the current situation. • Treating the work as a contingency will result in an increase in radiation exposure for the LSIV repair due

to rescheduling of certain work activities. However, a savings of approximately 13.5 person-rem will be realized for B1R13 is the LSIV repair is not required. The impact of airborne radioactivity will be minimized if the repairs are done in future outages without the presence of fuel leakage.

- The installation of a new containment loading system will eliminate previous industrial safety concerns encountered with installation of the temporary reactor vessel cover (TRVC). The TRVC can be used instead of the nozzle plug for cold leg isolation.
- Communications will be required to assure plant personnel are aware of the basis for the decision.
- Resources used to oversee and monitor the LSIV project can be used to provide assistance for other significant outage activities.
- There is an unrecoverable cost of $198,000 with the remainder of the funding (~$900,000) not being required in 2005, which could be placed in reserve. This cost is out weighed by the dose savings that would realized.
- Performing the work during future outages may impact outage duration goals for whichever outage it is performed. Detailed schedule reviews will need to be conducted to determine the actual impact to future outage durations.

RISKS ASSOCIATED WITH DECISION:

The risks associated with not performing the repairs to 1RC 8002C relate to safety (nuclear, radiological, industrial), organizational and cost (budget, outage duration). Each will be addressed separately.

Safety (Nuclear) –

The potential to generate loose parts from the 1RC 8002C was reviewed. In B1R10, modifications were made to the Unit 1 B, C, and D LSIVs. The modification installed a block in the valve that prevents the guide from moving into the travel path of the disc when it is closing. The original design had spir0l pins installed to prevent movement of the guide. The pins are made of 302 stainless steel, which is susceptible to stress corrosion cracking. The phenomena experienced in the industry is the wastage of these pins which leads to the valve guide potentially dropping down out of the guide slot into the valve seat where it typically became damaged and prevented the valve from complete valve closure. Discussions with vendor expertise (Westinghouse) noted that there is no history of valve guide failure on plants with similar design as Byron where the block modification was either installed during original construction or later. The plants in the industry that have had issues with the valve guide being damaged or generating loose parts are ones where the valve block design was never installed. The vendor did indicate that there are a couple of instances where repeated valve closure of LSIVs at high running loads caused cracking of guides. However, this was only seen on units without the welded blocks installed.

Difficulty in closing the LSIV can be attributed to the tolerance between the various valve components. There is a tolerance of .003 to .012 inches between the guide and the guide groove. The valve guide can move .115 inches vertically in the valve slot, with the valve body keeping the top of the guide in place. There is a tolerance of up to .030 inches between the guide and the guide block. This is the tolerance that would allow the guide to move laterally towards the center of the valve. During closure of the LSIV, guide lugs on the valve discs ride within the guides. The above noted tolerances can cause a shift of the guide within the groove that prevents smooth travel of the guide lugs along the entire length of the guide. Based on this interaction, a degree of valve binding is not uncommon. With the additional friction preventing smooth travel of the guide, full valve closure is prevented by the torque switch setting on the valve operator. The closing and opening of the valve eventually moves the valve guide back into alignment allowing the valve to fully close.

The Unit 2 LSIV's had the guide block installed prior to plant start-up. As stated previously, the Unit 1 valves (B, C, D) were modified after initial start-up and were done remotely with the use of robotics. The differences in installation methods may have caused the guide and guide block to be at the maximum tolerance. Confidence that the guide block is installed is based on a review of the work requests used during installation. It is recognized that no visual evidence remains (i.e. videotape, pictures), however there were independent quality control inspections performed during the installation. These inspections were at various stages of installation and provide the assurance that the guide block was installed within design tolerances.

The motor operator torque switch and corresponding thrust values are set to prevent damage to the guide. The values used at Byron are between 65,000 and 89,000 pounds thrust. These valve thrust values are based on generic valve information and not plant specific data, the worst case value was determined to be 116,000 pounds An evaluation was performed that noted that even if the guide had slid into the body of the valve, the force placed by the motor operator would not crack or bend (yield) the guide. With the installation of the guide block, there is high confidence that the guide and would not see the full forces of the disc (as compared to the guide being in the body of the valve). The forces that the guide would exhibit against the guide block were also reviewed. It was determined that, with the guide in the groove and the forces from valve disc closure, the guide block would remain in place. Additionally, during B1R09, the 1A cold leg LSIV was repaired. During this outage, the valve was unable to close and it was identified that the guide had fallen into the closure path of the valve.. This was prior to the modification that installed the valve blocks. Photographs of the guide indicated there was no damage to the guide as a result of the forces applied during attempts to close the valve.

Since it is not probable for the guide to be broke by the actuator and there is reasonable assurance that the valve block is installed, the condition of the 1C LSIV does not present a unique condition for the generation of loose parts. In addition, it is impossible, based on tolerances for an entire intact valve guide to become a loose part in the RCS

There is no industry experience that indicates a catastrophic failure of the valve would occur as a result of the difficulties experienced with valve closure due to the guides.

Even with the low probability that loose parts would be generated from the LSIV, evaluations were conducted to determine the impact of foreign material. The nuclear safety risk is associated with the introduction of foreign material that is either a pre-existing condition as a result of previous LSIV closures or potential of additional foreign material generation during the closure this outage. An evaluation was conducted following the difficulties encountered in B1R11. This evaluation was reviewed again for applicability for the difficulties during B1R12. The evaluations for B1R11 are as follows:

- Plant Review 02-023, "Possible Loose / Missing Parts on Valve Guide Mechanism for LSIV 8002C"
- 50.59 Validation Form 6H-02-0014, validation for "Westinghouse Eval 02-062, 50.59 screening, CAE-02-028. Byron 1, Loose Parts, 1C Loop Stop Valve"
- Westinghouse CAE-02-031, transmittal of "LSIV Loose Parts 50.59 Screen EVAL-02-062, Revision 1"

The evaluations conducted for B1R12 were as follows:

- Plant Review 03-018, "Unit One RCS Loop Stop Valve 1RC 8002C Potential Loose Parts"
- EC#344952, "Byron Unit 1 – Reactor Vessel Foreign Material Evaluation"
- Westinghouse CAE-03-08, "B1R12 RCS Foreign Material Evaluation Input"
- EC-EVAL 344956, "Evaluation of Foreign Material found on the Byron 1 Lower Core Plate during B1R12.

Plant Review 03-018 documented the evaluation of the prior plant review for B1R11 (02-023) as well as the performance of the valve during B1R12.

The foreign material evaluation reviewed the interactions with the following components:

a) Reactor vessel, internals, and incore instrumentation
b) Control rod drive mechanism
c) Nuclear fuel
d) Pressurizer
e) Reactor coolant pump
f) Loop stop isolation valve
g) Reactor coolant piping
h) Chemical volume and control system
i) Emergency core cooling system
j) Containment spray

The types of foreign material postulated were those from the LSIV and included two guides, three pins, guide stops and a valve fragment (from a previous analysis identified in a failure in 1999)

The evaluations for both outages concluded that there is no safety impact on the fuel or associated RCS components.

Two recommendations came from Plant Review 03-018, these were:

1) Start the 1C RCP first, coming out of B1R12. This will ensure loose parts are not carried into the 1C RCP due to reverse flow.

2) Use the LM system to listen to the C loop

The first recommendation will need to be reviewed to see if it should be carried forward following valve performance in B1R13. Discussion with Engineering identified that there have been no concerns identified as a result of recent LM (loose parts) on the 1C RCS loop.

The Byron Station valve Hit Impact Team (HIT) has identified proposed solution in the event that the 1RC 8002C fails to close. The plan includes continued electrical stroking of the valve, followed by manual closure of the valve. As found data of 1RC 8002C during closure will need to be evaluated to determine whether further damage may have occurred, and if so, the repair contingency would need to be implemented.

Discussions were held with Westinghouse regarding failure history of LSIV's to determine whether valve degradation can reach a point where the valve will not open after it has been close. There were no instances noted where the valve failed to open after similar difficulties with closure. There have been instances where the valve failed to close. For this situation repairs will be made to the valve. Other instances were noted where the valve did close however the guides were damaged and broken. The foreign material evaluations cover this situation, as described above.

<u>Conclusion -</u> The risk of existing foreign material has been evaluated and is considered minimal. Evaluations performed in the past bounds the potential additional foreign material that could be generated during B1R13 (provided 1RC 8002C closes during B1R13). As found data of 1RC 8002C during closure will need to be evaluated to determine whether further damage may have occurred, and if so, the repair contingency would need to be implemented.

<u>Safety (Radiological) –</u>

The radiation dose estimate for the currently scheduled 1RC 8002C work activities is approximately 14.5 person-rem. This includes support activities such as installation of a support beam and scaffolding. The installation of the support beam will need to be performed no matter when the 1RC 8002C will be repaired. This is expected to be a dose expenditure of approximately 1 person-rem. If the LSIV is repaired in accordance with the existing schedule, scaffolding work is estimated to take approximately 1.45 person rem. If the work is conducted as a contingency, the scaffolding will not be installed as it is identified in the current schedule and will occur late in the shutdown sequence. The schedule shift will increase the dose estimate for the scaffolding work by approximately .7 person-rem due to the contingency scaffolding being installed following forced oxidation.

If the work is handled as a contingency and is not performed, there will be an approximate savings for B1R13 of 13.5 person-rem. This savings will provide margin for the Station in meeting its dose goals for B1R13, especially given the fact that other high dose work is scheduled (e.g. split pin, 10 year ISI). The assumed dose savings does not take into account any potential difficulties encountered during the valve repair. During previous LSIV work in September 2000, the actual dose received for working on all four cold leg LSIVs was approximately six times greater than the original estimate. Lessons learned from that event were factored into the dose estimation for the repair to 1RC 8002C, however the potential exists for work difficulties resulting in additional dose. The actual amount of additional dose due to such difficulties cannot be quantified at this time.

Unit 1 has been operating with fuel leakage, and it is estimated that the affects on reactor coolant system activity will remain for at least the next two cycles. Therefore, dose rates for this outage and the next two outages are not expected to be different. The actual dose received will be dependent on when the work will be performed and the radiological conditions at the time. Radiation Protection has identified that the likelihood of airborne concerns will be minimized if the work is performed following an operational cycle with no fuel leakage.

<u>Conclusion –</u> Having the LSIV repair be performed as a contingency will increase the overall dose for the LSIV work if the valve requires maintenance. If the work is not required, based on performance of the valve, there will be a substantial savings for this outage, that may still need to be taken for any future repairs. Installation of the support beam this outage will enable repairs no matter when the valve repairs will be done. Performing the repairs in a future outage will minimize impact on airborne activity.

<u>Safety (Industrial) –</u>

The 10 year in-service inspection (ISI) is being performed during B1R13, this will have the lower core barrel removed which will allow access to the 1C cold leg nozzle. During normal refueling outages, this is not accessible to allow insertion of a nozzle plug for isolation to allow work on an LSIV. An alternative to installation of a nozzle plug would be to install the temporary reactor vessel cover (TRVC) during a normal refueling outage (non 10 year ISI). Industrial safety concerns exist with the use of the TRVC. This concern deals with moving the TRVC into containment through the containment hatch. The prior use of the TRVC experienced difficulties with industrial safety, the previous installation required an individual to "ride" the TRVC through the containment hatch. A new containment loading system has been put in place, which can be used to allow it to be rolled into containment, which eliminates the need to ride the TRVC, therefore eliminating the industrial safety concern. Aside from the industrial safety concerns experienced previously, the TRVC was successful during its previous use.

Conclusion –

LSIV work can be performed by using a nozzle plug (for isolation) or the TRVC. The new containment loading system being installed during B1R13 will improve the ability to install the TRVC in the future, which minimizes any industrial safety concerns.

Organizational – Though not quantifiable, personnel may view not performing the repairs as scheduled as reflection of outage goals (i.e. dose) taking precedence over plant safety. As noted previously, the risk of existing foreign material has been evaluated and evaluations performed in the past bounds the potential additional foreign material that could be generated during B1R13 (provided 1RC 8002C closes during B1R13). A nuclear safety concern does not exist, the decision relates to ALARA and cost. However a potential negative perception by personnel will need to be addressed. If the work is performed, this should not be raised as a concern.

Other organizational aspects include the resources being applied to oversight of the 1RC 8002C. The current outage has a good deal of unique work (i.e. split pin repair, 10 year ISI), the resources from the LSIV project (if work is not done) can be applied for assistance to the other projects.

Conclusion – If the decision is made to not repair 1RC 8002C as scheduled (treat as a contingency), a site-wide communication will be needed to explain the basis for the decision that was made.

Cost (Budget) – There has been pre-outage work performed to support the scheduled repairs of 1RC 8002C. This included, but not limited to, work package preparation, equipment mock-up training, and equipment purchase. If the work is handled as a contingency, it is estimated that $198,000 will not be recovered.

Conclusion – The overall project cost for the 1RC 8002C repairs is approximately $1,100, 000, some of the activities completed during this outage (support beam installation) can be used for future outages. There is an unrecoverable cost of $198,000 with the remainder of the funding (~$900,000) not being required in 2005, which could be placed in reserve. Similar costs, potentially unrecoverable, would need to be spent in a future outage to assure there is proper preparation to perform the work.

Cost (Outage Duration) –

The scheduling of repairs to 1RC 8002C into B1R13 was originally seen as a good fit, based on the duration of the outage. B1R13 is scheduled for 23 days with B1R14 having a business plan goal of 18 days. Repairs to 1RC 8002C in a future outage would require the use of the TRVC (as addressed previously). Preliminary estimates for a performing the repairs using the TRVC indicates that it would require an outage with a business plan goal of 20 days. This is a rough estimation, which will need to be subjected to reviews and challenges as is performed for all refueling outage planning.

Conclusion –

Performing the work during future outages may impact outage duration goals for whichever subsequent outage it is performed. Detailed schedule reviews and challenges (same as those within the current outage planning process) will need to be conducted to determine the actual impact to outage duration.

CONTINGENCY REQD:

The repairs to 1RC 8002C will need to be treated as a contingency repair. The schedule will need to be changed to reflect this change. If the valve closes, and no other conditions are noted that would indicate further valve degradation, then the repair will need to scheduled for a subsequent refueling outage (either scheduled or contingency).

A site wide communications will be needed to detail the basis for the decision to treat the repairs to 1RC 8002C as a contingency. If repairs are required, based on actual valve performance, an additional communication would be needed to indicate how the decision making process was followed

The 1C RCP should be started first coming out of B1R12. This will be to ensure any potential loose parts are not carried into the 1C RCP due to reverse flow. Attention will need to be placed for any loose parts monitoring system alarms.

The decision is to treat the work on the 1C LSIV as a contingency during B1R13 as well as future outages. A long term plan will need to be developed that would identify any additional diagnostic testing to be performed to assess valve performance during future outages. The long term plan should also address how the loose parts monitoring system will be used in diagnosing any issue involving the 1C LSIV.

PLANT LIMITATIONS IMPOSED:

Based on specific performance of 1RC 8002C during closure, an evaluation needs to be conducted to determine whether valve performance is consistent with previous performance noted in B1R11 and B1R12.

FUTURE ACTIONS REQUIRED: Y/N (Circle one). IF YES, EXPECTED CLOSURE DATE AND TRACKING MECHANISM (e.g. AR, WO, EC, CA #): IF NO, BASIS FOR CLOSURE:

Action #1 - Repairs to 1RC 8002C will need to be treated as a contingency repair. Schedule will need to be changed to reflect this change. If the valve closes, then the repair will need to scheduled for a subsequent refueling outage (either scheduled or contingency). AT # 307262-01 due 03/05/05 assigned to outage Work Control

Action #2 - A site wide communications will be needed to detail the basis for the decision to treat the repairs to 1RC 8002C as a contingency. If repairs are required, based on actual valve performance, an additional communication would be needed to indicate how the decision making process was followed. AT # 307262-02, due 03/05/05 assigned to Regulatory Assurance.

Action #3 – Start the 1C RCP first coming out of B1R12. This will be to ensure any potential loose parts are not carried into the 1C RCP due to reverse flow. Attention will need to be placed for any loose parts monitoring system alarms. This action is contained in the outage schedule for B1R13. To assure that this is captured for future Unit 1 outages, AT # 307262-03, due 9/01/05 is assigned to Outage Work Control

Action #4 Develop a long-term plan that identifies any additional diagnostic testing or inspection to be performed to assess valve performance during future outages. The long-term plan should also address how the loose parts monitoring system will be used in diagnosing any issue involving the 1C LSIV. AT 307262-04, due 9/1/05 assigned to Engineering.