BEFORE THE UNITED STATES

NUCLEAR REGULATORY COMMISSION

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| In the Matter of | ) | |
| | ) | |
| Omaha Public Power District | ) | Docket No. 50-285 |
| (Fort Calhoun Station | ) | |
| Unit No. 1) | ) | |

Submittal of Revised Information for Application for Amendment of
Facility Operating License - Additional Restrictions on the Main Steam Safety Valves

Pursuant to Section 50.90 of the regulations of the U. S. Nuclear Regulatory Commission ("the Commission"), Omaha Public Power District, holder of Facility Operating License No. DPR-40, has requested that the Technical Specifications set forth in Appendix A to that License be amended to incorporate additional restrictions on the operation of the Main Steam Safety Valves (MSSVs).

The proposed changes in Technical Specifications were provided in Attachment A to the Application dated March 26, 1997. A revised Discussion, Justification and No Significant Hazards Consideration Analysis, which demonstrates that the proposed changes do not involve significant hazards consideration, is appended in Attachment B of this submittal. The proposed changes in specifications would not authorize any change in the types or any increase in the amounts of effluents that will be released, or a change in the authorized power level of the facility.

WHEREFORE, Applicant has respectfully requested that Specification 2.1.6 and its Basis, of Appendix A to Facility Operating License No. DPR-40, be amended in the form attached as Attachment A to the Application dated March 26, 1997.

A copy of this submittal, including its attachments, has been submitted to the Director - Environmental Health Division, State of Nebraska, as required by 10 CFR 50.91.

OMAHA PUBLIC POWER DISTRICT

By W. G. Gates
Vice President

Subscribed and sworn to before me this 17th day of November, 1998.

Julie B Kuhr
Notary Public

GENERAL NOTARY-State of Nebraska
JULIE B. KUHR
My Comm. Exp. April 4, 2000

LIC-98-0150
Attachment A

# Supplemental Information for Application for Amendment of Facility Operating License - Additional Restrictions on the Main Steam Safety Valves

The following clarifications were requested by the NRC during a conference call on October 29, 1998:

The OPPD response on March 18, 1998 to a Request for Additional Information (RAI) question No. 2 stated that "The safety valves assumed in the analysis for inoperable valves were the lowest set-pressure valves of the large size (6"), with a set pressure of 1025 psia. These were shown to be the most limiting valves to fail and are much more limiting than the 2.5" valves (MS-291 and MS-292) which are at a lower set-pressure."

Question 1: It appears that there is another 6" valve with a lower set-pressure than 1025 psia. Confirm the set-pressure of the valves which are assumed inoperable in the analyses.

OPPD Response: The response to RAI question No. 2 had an incorrect value for the set pressure of the lowest pressure 6" MSSVs. The Engineering Analysis (EA) for the updated numbers was EA-FC-97-004 Revision 1 and as in the original analysis, made the lowest pressure 6" MSSVs inoperable. The correct set-pressure for these valves is 1000 psig, and is so documented in the EA.

Question 2: It is not clear in Attachment 6 of the response to the RAI that one MSSV per steam generator was assumed inoperable in the (Loss of FeedWater) LOFW analysis. In the March 26, 1997 submittal, it is stated in the last paragraph of page 3 (of the Discussion, Justification and No Significant Hazard Analysis) that "The results confirm that the effective increase in MSSV set pressure caused by the piping pressure losses leading to the primary safeties and MSSVs is acceptable. This is predicated on the fact that only one (1) MSSV may be inoperable per SG." Confirm that the assumption of one MSSV inoperable per SG was made in all cases of both the LOL and LOFW analyses.

OPPD Response: Having the lowest pressure 6" MSSV inoperable on each SG was used in all of the limiting LOL and LOFW cases with the following exceptions:

lofwmaxpp.out - This LOFW case, run for peak primary pressure did not have inoperable MSSVs. A sensitivity case was run to examine the effect of this addition, which raised the peak primary pressure by approximately 1 psi. This event is not the limiting event for peak primary pressure, so this increase is not significant.

loltest2-20.out - This LOL case, run for peak primary pressure did not have inoperable MSSVs, but is bounded by lolmaxpp6-20.out, which used a 6% PSV drift to provide the closest approach to the peak primary pressure limit.

Although not stated in Attachment 6 of the response to the RAI, the lowest pressure 6" MSSVs were assumed inoperable for the peak secondary pressure analysis case for the loss of feedwater analysis (lofwmaxspwtriphl-1.out). The specific designator for this case with a (-1) was an OPPD internal indication that the MSSVs were assumed inoperable. The maximum primary pressure case (lofwmaxpp.out) did not make the low pressure 6" MSSVs inoperable. A sensitivity case run to examine the effect of making the low pressure 6" MSSVs inoperable raised the peak primary pressure approximately 1 psia. This event is not limiting for peak primary pressure. For the loss of load analysis, the peak primary pressure case used to update the USAR (lolmaxtest2-20.out) does not have the lowest pressure 6" MSSVs inoperable, but the case for the 6% drift, listed on Page 2 of Attachment 4 (lolmaxpp6-20.out) does have the low pressure 6" MSSVs inoperable, and represents the closest approach to the primary pressure limit.

**Summary**:

lofwmaxpp.out - lowest pressure 6" MSSVs not inoperable (1 psia increase with 6" safeties inoperable)

lofwmaxspwtriphl-1.out - lowest pressure 6" MSSVs inoperable

lolmaxsp-1a.out - lowest pressure 6" MSSVs inoperable

lolmaxpp6-20.out - lowest pressure 6" MSSVs inoperable

The pressure for the opening of the MSSVs for the lolmaxsp-1a.out, lolmaxpp6-20.out, and lofwmaxspwtriphl-1.out should read 1056 psia. This is not a CESEC code output and must be inferred from code input and was not changed in the sequence of events from previous cases that did not have the valves inoperable.

LIC-98-0150
Attachment B

# Application for Amendment of Facility Operating License
# Additional Restrictions on the Main Steam Safety Valves

## Revised Discussion, Justification and No Significant Hazards Considerations

(References LIC-97-0049 dated March 26, 1997 and LIC-98-0038 dated March 18, 1998)

## DISCUSSION, JUSTIFICATION AND NO SIGNIFICANT HAZARDS CONSIDERATION

## DISCUSSION AND JUSTIFICATION

The Omaha Public Power District (OPPD) proposes to revise the Fort Calhoun Station (FCS) Unit No. 1 Technical Specifications (TS) 2.1.6, "Pressurizer and Main Steam Safety Valves," to incorporate additional restrictions on the Main Steam Safety Valves (MSSVs). These additional restrictions are a result of recent engineering analyses.

## BACKGROUND

FCS has two Steam Generators (SG), each with one 2 ½ -inch MSSV and four 6 -inch MSSVs. The purpose of the MSSVs is to limit the secondary system pressure to less than or equal to 110% of the design pressure of 1000 psia when passing 100% of design steam flow.

On January 15, 1997, an internal Condition Report was initiated indicating that piping pressure losses between the SG and MSSV inlets were not fully evaluated with respect to MSSV performance or not fully addressed within plant safety analyses which involve MSSV actuation. On January 17, 1997, FCS received a 10 CFR Part 21 report from Asea Brown Boveri - Combustion Engineering (ABB-CE) addressing this as a potential generic issue for plants utilizing the CESEC Code. This report recommended that licensees conduct a review to ensure that the unrecoverable piping pressure losses between the SG and the MSSV inlets have been fully addressed in applicable safety analyses and to review and adjust MSSV blowdown settings if necessary to assure stable valve operation.

An engineering analysis, independently verified by ABB-CE, was completed by OPPD. As a result of considering inlet pressure drop, additional restrictions must be incorporated in TS 2.1.6(3) on MSSVs. Currently TS 2.1.6(3) requires that eight (8) of the ten (10) MSSVs be operable during power operation (defined as reactor critical with power above 2%). The engineering analysis has shown that this requirement must be restricted to one (1) inoperable MSSV per SG.

## ANALYSES

Calculation of Pressure Losses

A review of isometric drawings shows that the system is made up of two headers each having approximately 100 feet of 26 inch ID piping having 1 SG outlet nozzle, 1-50% flow limiting venturi, and 5-90° elbows. The pressure drops in the main steam lines were then calculated and compared to values used in the plant safety analyses. The resulting identification that these pressure drop considerations had not been addressed in the plant safety analyses led to initiation of the internal Condition Report.

**DISCUSSION AND JUSTIFICATION (Continued)**

The pressure loss calculation assumed maximum design steam flow through the MSSVs coincident with Main Steam Isolation Valve (MSIV) closure without a reactor trip. The calculated pressure losses due to this configuration are 9.5 psid for main steam header piping losses. This value was confirmed to be conservative by measurements at 100% power conducted under a maintenance work order. Additional pressure drops due to steam flow through the branch inlets to the safety valves were calculated at 21.0 psid for the 2 ½ inch MSSV and 24.0 psid for the 6 inch MSSVs.

A review of existing calculations for line losses in the primary system was conducted and was determined to be 39 psid for the inlets to the primary safety valves.

Comparison of Valve Blowdown to Calculated Pressure Losses

The total losses (line losses and valve losses) of 30.5 psid (2 ½ inch valves) and 33.5 psid (6 inch valves) were compared to the valve blowdown which ~~is checked each refueling outage as part of the required surveillance test~~ was established and certified by the manufacturer and controlled by the positions of the internal adjusting rings. To ensure that the certified blowdown is not changed, the positions of the adjusting rings are verified whenever a valve is disassembled for setpoint testing and reassembled. Typically, testing is performed in-situ and disassembly is not required. The pressure losses are less than the 39 psid and 40 psid blowdown for the 2 ½ inch and 6 inch valve with the lowest setpoint (respectively). Therefore, the recommendation from the Part 21 to review blowdown settings versus pressure drops to preclude valve chatter was conducted and no changes are required at FCS.

CESEC-III CODE

All analyses were performed using the NRC-approved CESEC-III transient analysis methodology and computer code. The CESEC-III code employs a single-node model for the SG. As a result, spatial pressure variations within the SG cannot be computed by the code. The maximum and minimum secondary side SG pressures calculated by the code occur at the top of the tube sheet and at the steam outlet nozzle, respectively.

The CESEC-III model does not allow modeling of individual valves, rather it models sets of valves, one on each SG. Additionally, CESEC-III does not model the 2 ½ inch valves and therefore credit for opening of MS-291 and MS-292 was made by adjusting the valve area. The valve accumulation was increased from 3% to adjust for increased line losses as flow increases during the valve's flow. The CESEC-III model allows input of valve accumulation and blowdown for individual valves to address the lift setpoint of the valve at which the valve passes 70% flow and pressure at which the valve passes 100% flow. The MSSV characteristics are shown in Figure A.

**DISCUSSION AND JUSTIFICATION (Continued)**

Transient Analyses

The scope of the transient analyses was limited to evaluating the pressure drops in the piping run for both the primary and MSSVs to determine the impact on the peak primary and secondary system pressures, and to reflect recent changes. Recent changes include updating the SG parameters to account for 15.5% effective tube plugging, caused by additional tubes plugged during the 1996 refueling outage, and the presence of the SG orifice plate. Additional cases were also run to investigate the effect of 0% and 20% tube plugging. The applicable transient for peak primary system pressure is the Loss of Load, and for maximum secondary system pressure is Loss of Feedwater.

The assumptions were that the plant is operating at 1535.6 $MW_t$ (100% power + 2% uncertainty + reactor coolant pump heat), the MSSVs lifted at +3% of their nominal setpoints, the primary safety valve setpoints were adjusted to account for line losses and lifted at +1% of their setpoints, and the pressure losses in the main steam line to the SG were added to obtain the maximum secondary system pressure within the SG. Additional cases were evaluated with a +6% primary safety valve drift since this possibility is described in the Bases to TS 2.1.6.

The modeled CESEC-III MSSV valve areas of 0.4497 $ft^2$ were modified to account for piping pressure losses between the SG and MSSVs. Credit for opening of MS-291 and MS-292 was made by adjusting the initial valve area (prior to changing ratio for the pressures losses) to the total with MS-291 and MS-292.

The modeled original valve design's accumulation was modified from the value of 3% to account for piping pressure losses between the SG and the MSSVs and the differential pressure ($\Delta p$) developed as a result of flow through the valves.

The modeled valve actuation setpoints were modified to account for the pipe run $\Delta p$ that would exist prior to the valve's opening. This value is calculated in a conservative manner which assumes full flow to the lower setpoint MSSVs prior to a higher setpoint MSSV opening.

Results

The results are summarized in Table 1. The results confirm that the effective increase in MSSV set pressure caused by the piping pressure losses leading to the primary safeties and MSSVs is acceptable. This is predicated on the fact that only one (1) MSSV may be inoperable per SG. In order to generate acceptable results for the peak secondary pressure case, it was necessary to credit the Low Steam Generator Level Trip (LSGLT) for the Loss of Feedwater case. This is consistent with ABB-CE methodology.

**DISCUSSION AND JUSTIFICATION (Continued)**

Another methodology change was performed for the peak RCS pressure case for both the Loss of Load and Loss of Feedwater cases, where the All Rods Out scram worths/curves were used instead of the Power Dependent Insertion Limits (PDIL) curves. The ARO curves have the smallest initial scram worth as dictated by ABB-CE, and therefore are conservative. An additional assumption made for calculating the peak secondary pressure was that the Pressurizer Pressure Control System was in automatic to maximize primary to secondary heat transfer. The values for Loss of Feedwater Events Case 4 and Case 5 were previously revised in the Response to Request for Additional Information (LIC-98-0038) dated March 18, 1998.

PROPOSED TS CHANGES

In order to conform to the analyses' conclusions, it is proposed that TS 2.1.6(3) be revised to require four (4) of five (5) MSSVs associated with each SG be operable. Currently TS 2.1.6(3) states that the MSSVs be operable during power operation. This is being revised to state Modes 1 and 2 which are defined as power operation above 2% power, and reactor critical below 2% power, respectively. The additional requirements to maintain operable MSSVs during Mode 2 ensures that over pressure protection is provided when the reactor is critical.

Additionally, TS 2.1.6(3) does not contain any required actions if the LCO is not met, therefore TS 2.0.1 would be required to be entered. It is proposed that this be revised to require the plant be placed in hot standby within 6 hours (Mode 2) and hot shutdown (Mode 3), within an additional 6 hours. This ensures that the plant is placed in a condition where the MSSVs do not perform any safety related function and the Limiting Condition for Operations is not applicable. A total of twelve hours to be subcritical is consistent with other FCS TS and with ABB-CE Improved Standard TS. The setpoints for both the primary safety valves and MSSVs are being revised from pounds absolute to pounds gauge to be consistent with the nameplate values of the valves.

The basis of TS 2.1.6 is being revised to reflect the revised calculated total relief capacity of the ten MSSVs from $6.54 \times 10^6$ lb/hr to $6.606 \times 10^6$ lb/hr.

## TABLE 1

## RESULTS OF LOSS OF LOAD (LOL) AND LOSS OF FEEDWATER (LOFW) EVENTS

| Case Number | Peak Primary Pressure (psia) | Time (secs) | Peak Secondary Pressure (psia) | Time (secs) |
|---|---|---|---|---|
| **RESULTS OF LIMITING LOSS OF LOAD (LOL) EVENTS** | | | | |
| Case 1 - Limiting Secondary Pressure[1] | 2631.6 | 13.565 | 1097.42 | 19.455 |
| Case 2 - Limiting Primary Pressure[2] | 2649.0 | 11.587 | 1080.42 | 16.095 |
| Case 3 - Limiting Primary Pressure[2] with +6% primary safety valve drift | 2742.8 | 12.400 | 1088.71 | 15.002 |
| **RESULTS OF LIMITING LOSS OF FEEDWATER (LOFW) EVENTS** | | | | |
| Case 4 - Limiting Primary Pressure[3] | ~~2561.6~~ 2566.3 | ~~46.527~~ 42.980 | ~~1089.28~~ 1088.12 | ~~49.040~~ 44.660 |
| Case 5 - Limiting Secondary Pressure[1] | ~~2256.4~~ 2288.5 | ~~36.754~~ 37.172 | ~~1094.88~~ 1095.22 | ~~42.254~~ 42.257 |

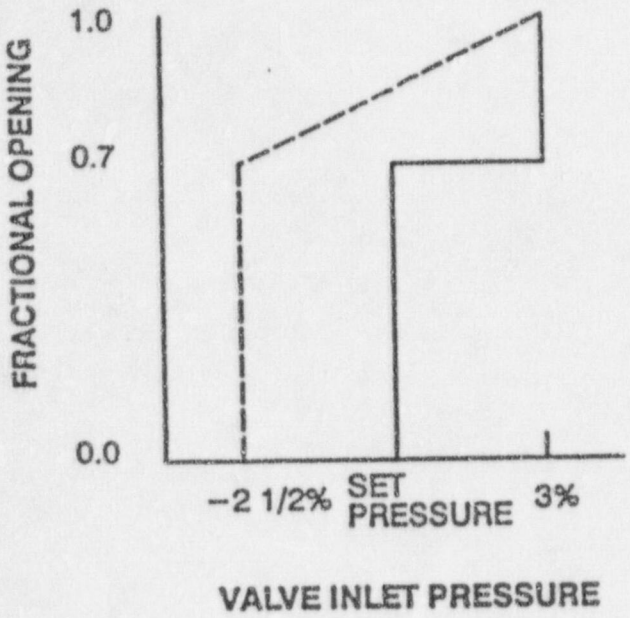
Notes

1. These limiting secondary pressure cases assume one MSSV inoperable per SG and the actual effective tube plugging of 15.5% of the SG tubes.
2. These limiting primary pressure cases assume 20% SG tube plugging.
3. This limiting primary pressure case assumes the actual effective tube plugging of 15.5% of the SG tubes. Tube plugging did not have a significant effect on the LOFW results.

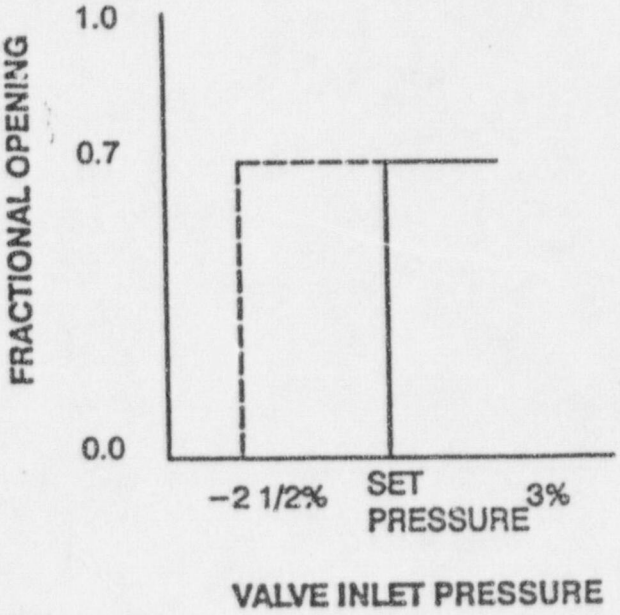
## FIGURE A

## SECONDARY SAFETY VALVE CHARACTERISTICS

FRACTIONAL VALVE FLOW AREA WHEN INLET PRESSURE REACHES GREATER THAN OR EQUAL TO 3% ABOVE THE SET PRESSURE DURING A TRANSIENT.




FRACTIONAL VALVE FLOW AREA WHEN INLET PRESSURE DOES NOT REACH 3% ABOVE THE VALVE SET PRESSURE DURING A TRANSIENT.




——— OPENING

– – – – – CLOSING

**BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION:**

The proposed changes do not involve significant hazards consideration because operation of Fort Calhoun Station (FCS) Unit No. 1 in accordance with these changes would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

The Omaha Public Power District (OPPD) proposes to revise the Fort Calhoun Station (FCS) Unit No. 1 Technical Specifications (TS) 2.1.6, "Pressurizer and Main Steam Safety Valves," to incorporate additional restrictions on the Main Steam Safety Valves (MSSVs) as a result of recent engineering analyses.

FCS has two Steam Generators (SG), each with one 2 ½ -inch MSSV and four 6 -inch MSSVs. The purpose of the MSSVs is to limit the secondary system pressure to less than or equal to 110% of the design pressure of 1000 lbs. per square inch absolute (psia) when passing 100% of design steam flow.

The pressure drops in the main steam lines were calculated. The total losses (line losses and valve losses) of 30.5 psid (2 ½ inch valves) and 33.5 psid (6 inch valves) were compared to the valve blowdown which ~~is adjusted/checked each refueling outage as part of the required surveillance test.~~ was established and certified by the manufacturer and controlled by the positions of the internal adjusting rings. To ensure that the certified blowdown is not changed, the positions of the adjusting rings are verified whenever a valve is disassembled for setpoint testing and reassembled. Typically, testing is performed in-situ and disassembly is not required. The pressure losses are less than the 39 psid and 40 psid blowdown for the 2 ½ inch and 6 inch valve with the lowest setpoint (respectively). Therefore, the recommendation from the Part 21 to review blowdown settings to preclude valve chatter was conducted and there is no concern at FCS. A review of existing calculations for line losses in the primary system was conducted and was determined to be 39 psid for the inlets to the primary safety valves.

Analyses were then conducted to determine the impact of the total line losses on previously analyzed accidents documented in the Updated Safety Analysis Report (USAR). The scope of the analyses was to evaluate the pressure drops in the piping run for both the primary and MSSVs to determine the impact on the peak primary and secondary system pressures. The applicable transient for peak primary system pressure is the Loss of Load, and for maximum secondary system pressure is the Loss of Feedwater. All analyses were performed using the NRC-approved CESEC-III transient analysis methodology and computer code.

The assumptions of the analyses were that the plant is operating at 1535.6 $MW_t$, (100% power + 2% uncertainty + reactor coolant pump heat), the MSSVs lifted at +3% of their nominal setpoints, the primary safety valve setpoints were adjusted to account for line losses and lifting at +1% of their setpoints, and the pressure losses in the main steam line to the SG

**BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION (Continued):**

cases were evaluated with a +6% primary safety valve drift since this possibility is described in the Bases to TS 2.1.6.

The results from these analyses confirm that the effective increase in MSSV set pressure caused by the piping pressure losses leading to the primary safeties and MSSVs is below the 1100 psia design limit for the secondary system, and below the 2750 psia design limit for the primary system. This is predicated on the fact that only one (1) MSSV may be inoperable per SG.

Failure of a MSSV is not an initiator of any previously analyzed accident, and therefore the proposed changes do not increase the probability of an accident previously analyzed. The proposed change to revise TS 2.1.6 to allow only one MSSV per SG to be inoperable has been shown, utilizing NRC approved methodology, to limit the design pressure to values below the design limits. An administrative change to revise the TS setpoint value for both the primary safety valves and MSSVs from pounds absolute to pounds gauge is proposed to be consistent with the nameplate values of the valves and has no effect on any analyses. Therefore the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated.

There will be no physical alterations to the plant configuration, changes in operating modes, setpoints, or testing methods. The additional restrictions being incorporated into the TS on MSSV operation will ensure that the design basis limits of 110% of design pressure will be met for the primary and secondary systems for analyzed accidents when considering inlet pipe pressure drops. The possibility of valve chatter being caused by the additional pressure losses identified in the Main Steam lines and MSSVs was reviewed and is not a concern. This is due to the valve blowdown (the difference between a valve's opening pressure and closing pressure) being greater than the pressure losses. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

**BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION (Continued):**

(3) Involve a significant reduction in a margin of safety.

The proposed change results in a peak primary pressure of 2649 psia (with 1% primary safety valve drift as allowed by TS 2.1.6) and peak secondary pressure of 1081 psia for the loss of load event compared to 2632 psia and 1075 psia documented in USAR Section 14.9. The proposed change results in a peak primary pressure of 2562 psia and peak secondary pressure of 1090 psia for the loss of feedwater event compared to 2487 psia and 1052 psia documented in USAR Section 14.10. The analyses confirm that the primary and secondary systems will continue to be below their respective design limits of 2750 psia and 1100 psia. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Therefore based on the above considerations, it is OPPD's position that this proposed amendment does not involve significant hazards considerations as defined by 10 CFR 50.92 and the proposed changes will not result in a condition which significantly alters the impact of the Station on the environment. Thus, the proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and pursuant to 10 CFR 51.22(b), no environmental assessment need be prepared.