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SWS Room Cooling Required Action

Pre-Submittal Meeting

March 15, 2011

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INTRODUCTION

- *The ANO-1 Technical Specifications (TSs) do not specifically address room cooling support features for TS-supported equipment*
- *ANO-1 received a non-cited violation for not entering supported equipment TSs when a single cooling subsystem was inoperable*
- *Lack of guidance in this matter results in conservatively entering TSs associated with the supported electrical equipment (8 hour Completion Time).*

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PURPOSE

Determine or develop appropriate actions that will address time periods when a non-TS room cooling subsystem is out-of-service considering its impact on TS-required equipment

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OUTLINE

- *Brief History*
- *Configuration Assessment*
- *Function of the Service Water System (SWS)*
- *Normal Room Cooling*
- *Emergency Room Cooling*
- *Impact on Electrical Equipment*
- *Proposed Options*
- *Conclusion*

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REGULATORY HISTORY

- *Following initial startup in the 1970s, a lack of an emergency cooling subsystem for ANO-1 electrical bus areas was identified*
- *Vital powered, non-Q VUC-13A/B installed at ANO-1 in interim. Q-emergency cooling subsystem installed soon thereafter consisting of Service Water (SW) cooled VCH-4A/B chillers and associated room coolers VUC-14A/B/C/D and VUC-2B/D*

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REGULATORY HISTORY

- ***ANO-1 established proceduralized compensatory measures and analysis to support maintenance on one subsystem train while maintaining operability of TS-supported electrical equipment***
- ***Compensatory measures included reliance on remaining SW train and chiller subsystem, reliance on non-Q vital powered VUC-13A/B, and/or convection cooling via compensatory measures***

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REGULATORY HISTORY

- ***Recently, the validity of these evaluations and analysis had been challenged and ANO-1 received a non-cited violation for failing to enter supported system TSs when one cooling subsystem was inoperable***

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CONFIGURATION ASSESSMENT

- ***Adequate cooling for both trains of electrical equipment can be provided through established compensatory measures, assuming either the remaining operable VCH-4A/B chiller or the vital powered non-Q VUC-13A/B coolers are available. However, the non-Q VUC-13A/B coolers are not credited in the current analysis.***
- ***Station risk verified to be acceptable when one room cooling subsystem train inoperable***

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CONFIGURATION ASSESSMENT

An evaluation of risk associated with one train of the emergency room cooling subsystem was performed over a 7-day period and found to be acceptable.

- ***Incremental core damage probability (ICCDP) = 5.22E-08***
- ***Incremental conditional large early release probability conservatively taken as 5.22E-09***
- ***Sensitivity analysis of common cause failure modes results in ICCDP = 5.70E-08***
- ***External event ICCDP = 1.04E-07***

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CONFIGURATION ASSESSMENT

- ***ANO initiated action to determine what TSs, if any, should be applied when one room cooling subsystem was inoperable***
- ***Based on industry input and that SW provides the ultimate support needed to cool the areas, ANO believes that the SW TS should be applied***

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CONFIGURATION ASSESSMENT

- *The SWS provides the ultimate cooling support function to a wide array of safety-related and TS-required equipment*
- *The 72-hour Completion Time provides a reasonable period to restore the support function for supported equipment not immediately challenged by a loss of a SWS loop and is based on the redundant capabilities afforded by the operable loop and systems, and the low probability of an accident during this period*
- *LCO 3.0.6 must also be entered to ensure a loss of safety function does not exist*
- *It is not unusual for support system restoration periods to be longer than the supported system (i.e., 24 hours to restore inverters while the respective bus must be restored in 8 hours)*

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FUNCTION OF THE SWS

Major safety related components supported by the SWS include:

- ***Decay Heat Removal (DHR) Heat Exchangers***
- ***Reactor Building Coolers***
- ***DHR (Low Pressure Injection) Pump Jacket / Bearings Coolers***
- ***Emergency Diesel Generator (EDG) Cooling***
- ***Makeup (High Pressure Injection (HPI)) Pump Lube Oil Coolers***
- ***Reactor Building Spray (RBS) Pump Jacket / Lube Oil Coolers***
- ***Backup Supply to Emergency Feedwater (EFW) Pumps***

The SWS removes heat from rooms via the following subsystems:

- ***Makeup (HPI) Pump Room Coolers***
- ***DHR (LPI) Pump Room Coolers (two coolers per train)***
- ***Emergency Switchgear Room Chillers (discussed below)***

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FUNCTION OF THE SWS

The SWS does not mitigate accidents in and of itself, but is a support system

The SWS supports the removal of post-accident residual heat from the reactor core and cooling the Reactor Building atmosphere

Most SWS room cooling subsystems provide heat removal support for equipment located in a single room. However, switchgear room cooling involves several different rooms housing various TS-required equipment

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NORMAL ROOM COOLING

Available cooling sources: (see drawing)

- *Normal Auxiliary Building ventilation VSF-7A/B, VEF-8A/B*
- *Normal vital powered switchgear room coolers VUC-2A/C and non-Q cooler VSF-10*
- *Vital powered, self-contained coolers VUC-13A/B*
- *Self-contained cooler VUC-11*
- *Room exhaust fans*

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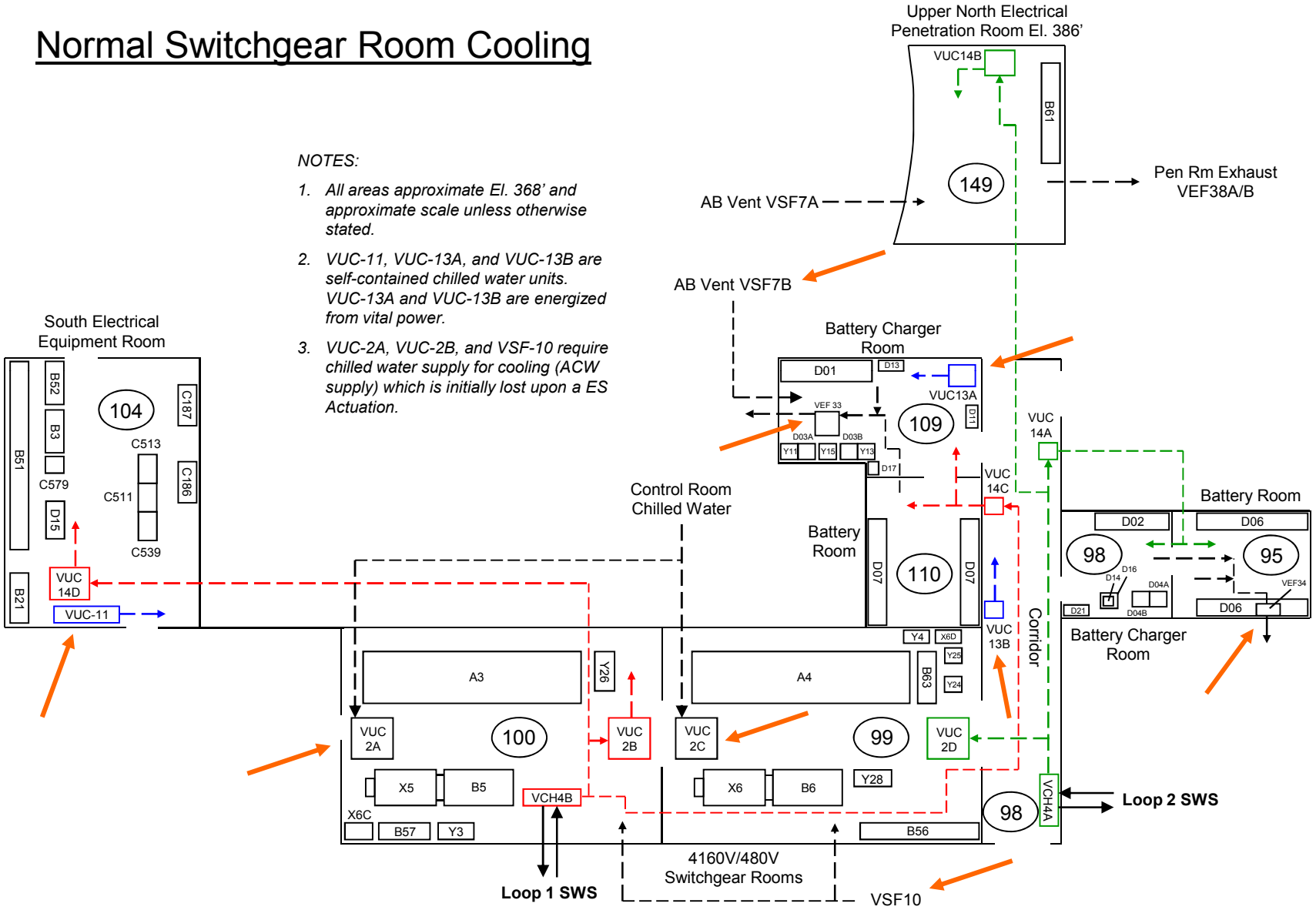
Normal Switchgear Room Cooling

NOTES:

1. *All areas approximate El. 368' and approximate scale unless otherwise stated.*
2. *VUC-11, VUC-13A, and VUC-13B are self-contained chilled water units. VUC-13A and VUC-13B are energized from vital power.*
3. *VUC-2A, VUC-2B, and VSF-10 require chilled water supply for cooling (ACW supply) which is initially lost upon a ES Actuation.*



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EMERGENCY ROOM COOLING

Available cooling sources: (see drawing)

- *Coolers VUC-14A/B/C/D and VUC-2B/D supplied by SWS-cooled chillers VCH-4A/B*
- *Vital powered, self-contained coolers VUC-13A/B should remain available*
- *TS-required Penetration Room ventilation VEF-38A/B (forced air exhaust only)*
- *Vital powered room exhaust fans should remain available*

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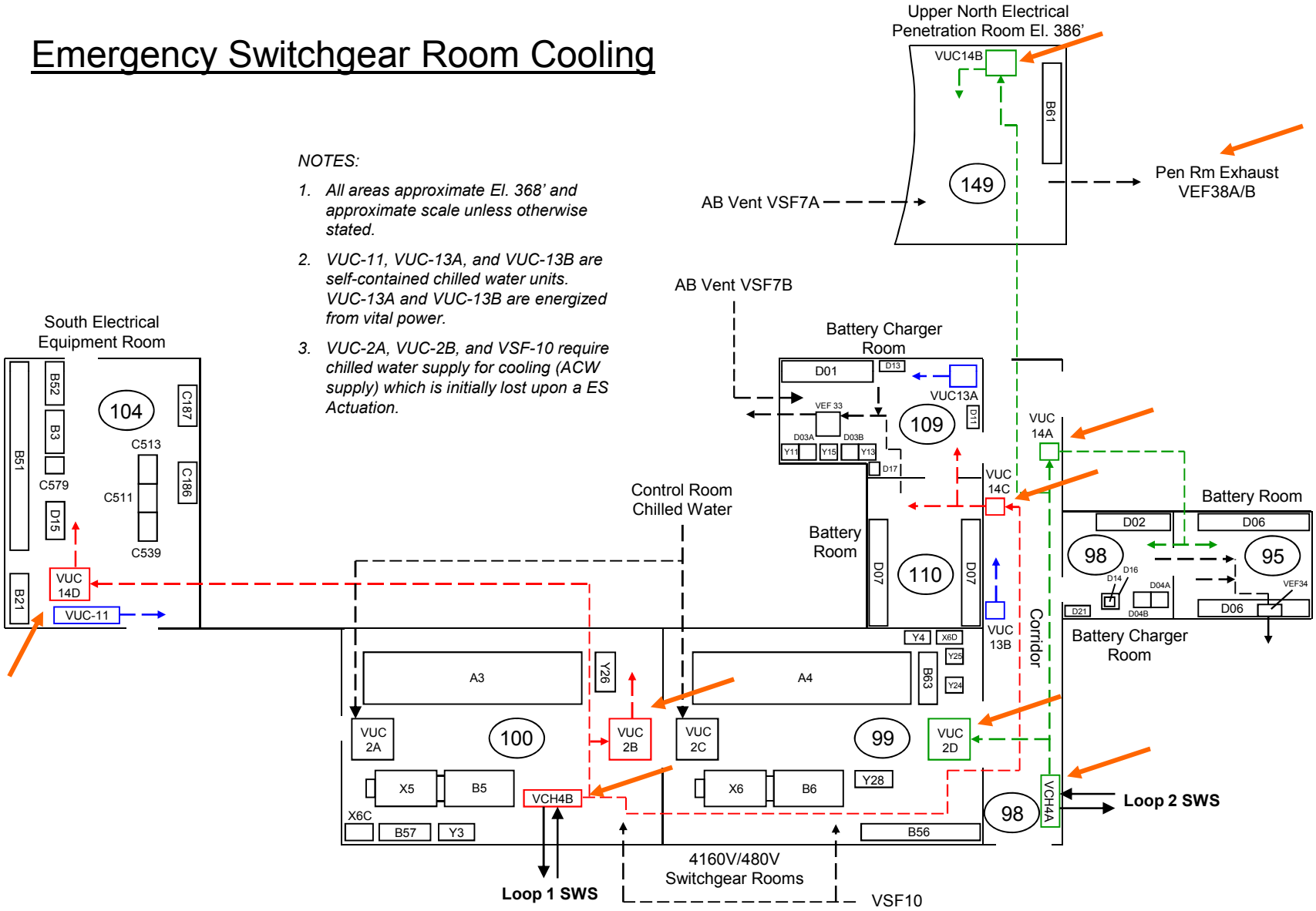
Emergency Switchgear Room Cooling

NOTES:

1. *All areas approximate El. 368' and approximate scale unless otherwise stated.*
2. *VUC-11, VUC-13A, and VUC-13B are self-contained chilled water units. VUC-13A and VUC-13B are energized from vital power.*
3. *VUC-2A, VUC-2B, and VSF-10 require chilled water supply for cooling (ACW supply) which is initially lost upon a ES Actuation.*



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IMPACT TO ELECTRICAL EQUIPMENT

Current procedural guidance requires implementation of compensatory measures to limit equipment impact when one train of the cooling subsystem is inoperable. Actions have been evaluated against resources and timing, and found to be acceptable.

- ***Pre-determined doors are opened to enhance convection cooling***
- ***Unnecessary loads are reduced***
- ***Other ventilation (Q & non-Q) is verified in operation or available***
- ***Increased monitoring***

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IMPACT TO ELECTRICAL EQUIPMENT

No impact to equipment during normal operations.

Limited impact post-accident:

- ***No vital battery or inverter impact during the respective 2-hour post-accident mission time***
- ***Analysis currently underway to determine impact on associated rooms with no chillers available crediting convection cooling only using refined techniques***

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IMPACT TO ELECTRICAL EQUIPMENT

Cooling sources expected to be available post-accident assuming one train of the emergency room cooling subsystem previously out of service and offsite power is lost:

- ***Coolers VUC-14A/B and VUC-2D supplied by SWS-cooled chiller VCH-4A OR Coolers VUC-14C/D and VUC-2B supplied by SWS-cooled chiller VCH-4B.***
- ***Vital powered, self-contained coolers VUC-13A/B***
- ***Various room exhaust fans should remain available***
- ***Convection cooling via compensatory measures***

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IMPACT TO ELECTRICAL EQUIPMENT

If offsite power remains available, additional cooling and ventilation sources are expected to be available post-accident assuming one train of the emergency room cooling subsystem was previously out of service:

****requires Auxiliary Cooling Water to be restored if more than forced air is needed***

- ***Auxiliary Building supply/exhaust *VSF-7A/B, VEF-8A/B***
- ***Normal vital powered switchgear room coolers *VUC-2A/C, and non-vital/non-Q cooler *VSF-10***
- ***Self-contained cooler VUC-11***

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PROPOSED OPTIONS

The following options are under consideration by ANO:

- ***Using Part 9900 guidance, further evaluate the effects of a loss of both emergency room cooling subsystem trains (unlikely to validate design temperature limits not exceeded in all rooms under all ambient conditions)***
- ***Enter into existing SWS TS when one train of the SWS emergency room cooling subsystem is out of service.***
- ***Develop new separate TS for these subsystems (this would be a significant deviation from Standard TSs)***
- ***Add action to SW TS (see next page)***

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PROPOSED OPTIONS

A. One SWS loop inoperable for reasons other than Condition B.	A.1 ----------NOTES---------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources – Operating," for diesel generator made inoperable by SWS. 2. Enter Applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops – MODE 4," for decay heat removal made inoperable by SWS ---------- Restore SWS loop to OPERABLE status.	72 hours
B. Required SWS room/ area cooling subsystem(s) associated with a single SWS loop inoperable.	B.1 Restore required SWS room/area cooling subsystem(s) to OPERABLE status.	72 hours
C. Required Actions and associated Completion Times not met.	C.1 Be in Mode 3. AND C.2 Be in Mode 5.	6 hours 36 hours

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CONCLUSION

ANO proposes entry into SWS TS Condition A in its current form. The SWS TS addresses the room cooling function of required room coolers. The SWS LCO provides reasonable actions considering the impact of the potential conditions. LBDs and procedures would be revised accordingly in accordance with 10 CFR 50.59.

If necessary, ANO can propose a change to the SWS TS specifying a Required Action for the room cooling function of required room coolers. Prompt review of the change would be desired to avoid the potential for unnecessary plant maneuvering resulting from current interpretations, or a request for a Notice of Enforcement Discretion.

OPEN DISCUSSION