



December 10, 2015

NG-15-0344

U.S. Nuclear Regulatory Commission  
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Washington, D.C. 20555-0001

Duane Arnold Energy Center  
Docket 50-331  
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Technical Specification 5.6.6 Post Accident Monitoring (PAM) Report,  
December 2015

The purpose of this letter is to submit the attached report required by the Duane Arnold Energy Center Technical Specifications (TS) Section 5.6.6, Post Accident Monitoring (PAM) Report. This letter makes no new commitments or changes to any existing commitments.

A handwritten signature in black ink that reads "Steven P. Brown".

FOR/ T. A. Vehec  
Vice President, Duane Arnold Energy Center  
NextEra Energy Duane Arnold, LLC

Enclosure: Technical Specification 5.6.6 Post-Accident Monitoring (PAM) Report,  
December, 2015

cc: Administrator, Region III, USNRC  
Project Manager, DAEC, USNRC  
Resident Inspector, DAEC, USNRC

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Enclosure to NG-15-0344

Technical Specification 5.6.6 Post-Accident Monitoring (PAM) Report,  
December, 2015

4 pages follow

**Technical Specification 5.6.6 Post-Accident Monitoring  
(PAM) Instrumentation 14-Day Report, December 10, 2015**

**Background**

On November 3, 2015 at 0910, while operating at 100% power, a Control Room operator cycled CV4639, the Inboard Recirculation Sample Primary Containment Isolation Valve (PCIV) and a loss of Post Accident Monitoring (PAM) valve position indication occurred. This required an entry into a Technical Specifications (TS) inoperability condition for CV4639 open position indication.

No automatic actions such as PCIV closure were prevented by the CV4639 open position indication failure. The open position indication of CV4639 was considered inoperable and required an entry into TS Section 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation" Condition A, as Function 6 in Table 3.3.3.1-1 (PCIV position) was not Operable for CV4639. Condition A requires restoration of the required indication channel to an Operable status within 30 days. Resolution of the issue within 30 days (December 3, 2015) was not achieved, then requiring, per TS 3.3.3.1 Condition B, that a report be submitted within the following 14 days (December 17, 2015) in accordance with TS Section 5.6.6. "PAM Report".

The TS 5.6.6 PAM report requirement states the cause of the inoperability is to be discussed along with plans for restoration. The report requirement also assumes the condition has not been corrected and as such calls for outlining alternate monitoring methods and their equivalency to the lost function, or justification of non-equivalency.

There was a prior occurrence of the open CV4639 position indication issue on September 9, 2015, and although the indication was subsequently restored to Operable but Degraded status, a PAM report was submitted on October 22, 2015 (NG-15-0315) since the 30-day LCO was exceeded. This report noted that an Adverse Condition Monitoring Plan (ACMP) was now in use during CV4639 cycling, and alternate monitoring would be implemented if the CV4639 open indication became inoperable prior to final resolution of the cause of the issue. This alternate monitoring was implemented on November 3, 2015 following identification of the inoperability condition for CV4639 open position indication.

**Cause of the Inoperability**

The most likely cause of the loss of the Control Room indication of CV4639 open position is a spring in the open position indicating limit switch that can have reduced force when operating in its current environmental conditions. This limit switch is

located inside the Primary Containment within the drywell structure, so it is not accessible during plant operation. The cause analysis with extent of condition will be finalized when drywell entry is possible.

The CV4639 open position indicating limit switch was installed in October 2014 during a refueling outage. The manufacturer, NAMCO, submitted a 10CFR 21.21(d)(3)(i) (Part 21) report (Event Notification 51280) on July 31, 2015 documenting that one lot of springs that are internal to the limit switch model (EA180-31402) has a reduced spring force when in a continuous ambient temperature above 123°F, meaning the limit switch will not consistently return to its initial, unactuated, position. In August, 2015 as part of the plant's Part 21 impact review, it was determined the open position limit switch of CV4639, installed October 15, 2014, was the sole plant component having a spring from the suspect lot. The switch is located in an area of the drywell where operating temperatures are between 130°F and 145°F during power operation. For CV4639, the "initial, unactuated position" corresponds to an illuminated red (open) light. A work request was initiated as part of the Part 21 review to replace the limit switch during a plant shutdown when drywell access is permitted. There has been no plant shutdown since that time. The indication provided by this limit switch is also used for valve closing time testing.

Following the November 3, 2015 event, CV4639 was cycled 8 times, but after the initial closure of the valve, the open indication (red light) never returned when the valve was re-opened. The ACMP directions for alternate monitoring were used to confirm that the valve itself was open. The Part 21 notice states the reduced spring force only affects the switch's ability to return to its initial, unactuated position, not its ability to maintain the unactuated position. The open indication (red light) is the unactuated position. The closing force of CV4639 overcomes the limit switch spring force to turn the red light off. The purpose of the (reduced force) spring in this application is to turn the red light back on after a full valve closure. CV4639 is maintained in the open (red) position during online operation (Modes 1, 2 and 3) except during quarterly testing. With the red light on, the PAM function of verifying CV4639 closed upon a Primary Containment Isolation signal can be successfully completed. However, as noted, on November 3 the red light remained off even after several attempts were made to restore the indication by cycling CV4639 via the Control Room hand switch.

### **Alternate Method of Monitoring**

Only the red light is on when CV4639 is open and only the green light is on when CV4639 is closed. If CV4639 is intermediate, both lights are on. With the open (red) indication not working, a full open valve position can be deduced if there is not a green

(closed) light. However, if there is a green (closed) light, it is not possible to determine if the CV4639 valve position is intermediate (red and green lights) or the flow path is isolated (green light only).

As previously noted, an Adverse Condition Monitoring Plan had already been established to monitor the CV4639 Control Room open (red) indication whenever the valve was cycled. The ACMP required that if loss of the red light with the valve open occurred, the CV4639 PAM valve position indication function would be declared Inoperable, and alternate monitoring of valve position would be implemented until position indication operability could be restored.

The outboard isolation valve on the line, CV4640, is Operable, including its indication. No isolation signal was present and CV4640 was in the open position at the time of the CV4639 position indication inoperability. The ACMP requires confirmation of the Primary Containment penetration's status, and directs use of a process computer point available in the Control Room that monitors flow through the penetration for the Crack Arrest Verification (CAV) system. Ongoing flow through the penetration was indicated by the computer point, indicating CV4639 was also open and the penetration was not isolated.

Under current conditions, if CV4640 is closed, its position indication in the Control Room will confirm the penetration is isolated. Should there be simultaneous issues with both CV4639 and CV4640 valve position indication, the CAV flow measurement could be used to confirm penetration isolation.

#### **Degree of Equivalence of Alternate Indication**

Through the use of the CAV computer point, the ability to determine CV4639 position, if needed, will remain available in the Control Room. The CAV flow measurement can be used in the Control Room to confirm penetration isolation, and in conjunction with the CV4640 position indication, the CAV measurement can also indicate when CV4639 is in the open position.

#### **Justification of Areas of Alternate Indication Non-Equivalency**

The computer providing the CAV flow indication is not seismically qualified, however, based on engineering judgment it is sufficiently robust to monitor flow in the design basis event. The flow element which serves it does not require electric power. The

flow transmitter and computer that receives the signal are energized from a lighting panel that is powered by an essential power supply (1B35).

No automatic actions (such as penetration isolation) are prevented by the inoperability of the CV4639 open indication. Based on engineering judgment, the alternate method available to determine the status of the Recirculation Sample penetration provides operators with suitable reliable indication.

### **Plans and Schedule for Resolving the Operable but Degraded Condition**

Replacement of the limit switch for CV4639 to correct the condition identified in the NAMCO Controls Part 21 notice requires a plant shutdown with drywell entry. The limit switch will be replaced as opportunity allows and no later than the next scheduled refueling outage (currently October 2016).

### **Assessment of Safety Consequences:**

The Primary Containment penetration in question is served by isolation valves CV4639 and CV4640 in series. Both of these valves receive a close signal when conditions require isolation of Primary Containment. Each of these PCIVs has position indication in the Control Room. The closed (green) and open (red) position indications remained Operable for CV4640, the Outboard Recirculation Sample PCIV. The closed (green) position indication also remained Operable for CV4639. The open (red) indication for CV4639 is Inoperable. With the CV4639 open position indication not available, neither intermediate nor open CV4639 valve position is directly indicated in the Control Room.

With CV4640 and its position indication Operable, upon isolation of Primary Containment the Control Room operators would be able to verify the closed (isolated) status of the penetration flow path. If CV4640, or its indication, are rendered Inoperable the Control Room will use the alternate indication method given in the ACMP to verify the penetration flow path is closed. The loss of the CV4639 open indication represents a loss of redundancy with respect to the capability of verifying that Primary Containment isolation of the Recirculation sample line penetration had been achieved. The valve position indication is independent from valve operation, and the actual capability of CV4639 to isolate upon a Primary Containment Isolation signal is not impacted.